ATOMKI

ANNUAL REPORT

1982

INSTITUTE OF NUCLEAR RESEARCH
OF THE HUNGARIAN ACADEMY OF SCIENCES
DEBRECEN, HUNGARY

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ATOMKI

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CONTENTS

PREFACE

It is for the first time now that we survey the current activity and results of ATOMKI in the form of an Annual Report. This Report is a successor of the annual publication lists issued up to last year. The latest numbers of these lists do already contain abstracts of some papers, which, in an extended fashion, constitute the main body of this Report as well. In the Annual Report we wish to give more detailed, comprehensive and up-to-date information on our activity.

Apart form status reports, which give account of the progress of the major experimental facilities and projects, the main part of this Report consists of the list of publications submitted or published in 1982. The titles are supplemented with the place of appearance or submission, and in most cases with extended abstracts. To complement the account of our activity, we also enter information on theses and scientific lectures. To unify the presentation and facilitate the use of this Report, all material included is written in English, indicating also the original language of the publication.

The material is organized according to the following main subjects: nuclear physics, atomic physics, analitical application of atomic and nuclear methods (in industry, agriculture, biology, medical sciences, etc.), earth sciences, environmental research and development of various methods and instruments. At the end of the Report the list of the Seminars of the Institute held in 1982 are also included.

In the future we intend to continue the publication of Annual Reports. We hope that by giving a more complete picture of the activity and results of ATOMKI, we improve our communication with the outside world.

The editor thanks R. G. Lovas for his contribution to the editorial work, and thanks Mrs. Darin for compiling the material of this Annual Report.

J. Pálinkás

NUCLEAR PHYSICS

THEORETICAL NUCLEAR PHYSICS

MICROSCOPIC DESCRIPTION OF ^{7}LI AND ^{7}BE FOR THE DWBA TREATMENT OF CLUSTER TRANSFER REACTIONS

K. F. Pál, R. G. Lovas, M. A. Nagarajan*, B. Gyarmati and T. Vertse

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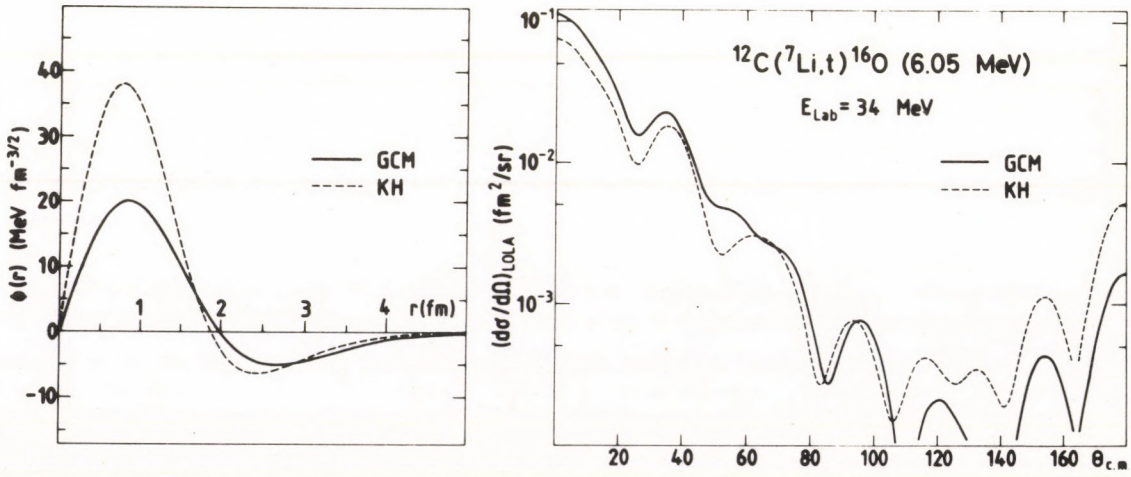
Submitted to Nuclear Physics A

The reliability of (^{7}Li,t) reactions as spectroscopic tools depends on the goodness of the ^{7}Li wave functions used. This function enters into the DWBA amplitude through the potential overlap[1])

$$\phi(r)=(7!/3!4!)^{\frac{1}{2}}\langle\phi_\alpha\phi_t|V_{\alpha-t}|\phi_{Li}\rangle_r,$$

where ϕ are the (antisymmetrized) internal wave functions, $V_{\alpha-t}$ is the sum of the internucleon forces that act between the two fragments, and r is the distance of their c.m. The usual phenomenological approach postulates a local two-body force $U_{\alpha-t}(r)$ and replaces ϕ by $\phi_L(r)=U_{\alpha-t}(r)u(r)$, where u is a bound-state wave function in $U_{\alpha-t}$. A previous model due to Kubo and Hirata[2]) (KH) used the result of a microscopic calculation to determine the shape of $U_{\alpha-t}$. But, to our knowledge, no attempt has been made to calculate ϕ directly from the N-N force and the corresponding microscopic wave function or to justify the use of a local $U_{\alpha-t}$. We report now on our calculation of ϕ in the generator coordinate model (GCM) and its application to the ^{12}C(^{7}Li,t) O(0$^+$, 6.05 MeV) transition. In the GCM the ^{7}Li was assumed to be composed of undistorted α and t clusters of equal size[3]). In the example to be shown the Volkov 2[4]) plus Coulomb force was used adjusted to reproduce the experimental separation energy, and ϕ was calculated exactly with the Coulomb force excluded from $V_{\alpha-t}$.



The figures compare the GCM and KH potential overlaps and the DWBA cross sections they produce. The overlaps are very different. We found that the performance of simple smooth $U_{\alpha-t}$ potentials in reproducing ϕ is poor in general. We recommend the use of our potential overlap in further analyses of (^{7}Li,t), (^{7}Li,α) and the inverse processes. Both this and the $\alpha+^3$He potential overlap are available in forms easy to apply both in LOLA and DWUCK5.

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GENERATOR-COORDINATE CALCULATION OF THE POTENTIAL OVERLAP FOR THE DWBA DESCRIPTION OF CLUSTER TRANSFER REACTIONS

R. G. Lovas, K. F. Pál and M. A. Nagarajan*

*Daresbury Laboratory, Warrington, UK

Submitted to Nuclear Physics A

The DWBA amplitude of the A(a,b)B (a=b+x) process involves the potential overlap

$$\phi(r)=(a!/b!x!)^{\frac{1}{2}}\langle\phi_b\phi_x|V_{b-x}|\phi_a\rangle_r, \qquad (1)$$

where ϕ are antisymmetrized internal wave functions and V_{b-x} is the sum of internucleon forces between b and x. A best means of determining ϕ is from the generator coordinate model (GCM) for a, in which the trial functions is schematically

$$\psi_a=\int dS S^2 f^0(S) A_{b-x}\{\psi_b\psi_x\}_S + \text{distortion terms}, \qquad (2)$$

where ψ_b and ψ_x, which are c.m. factors times ϕ_b and ϕ_x respectively, are pinned down at the distance of S from each other, A_{b-x} is the intercluster antisymmetrizer, and $f^0(S)$ is the GCM amplitude. In general, it is difficult to compute because of its asymmetric form.

We have elaborated two exact and two approximate methods for evaluating (1). We applied them to ^{7}Li composed of α and t clusters of equal size represented by harmonic oscillator (h.o.) wave functions (see K. F. Pál et al., contribution to this volume).

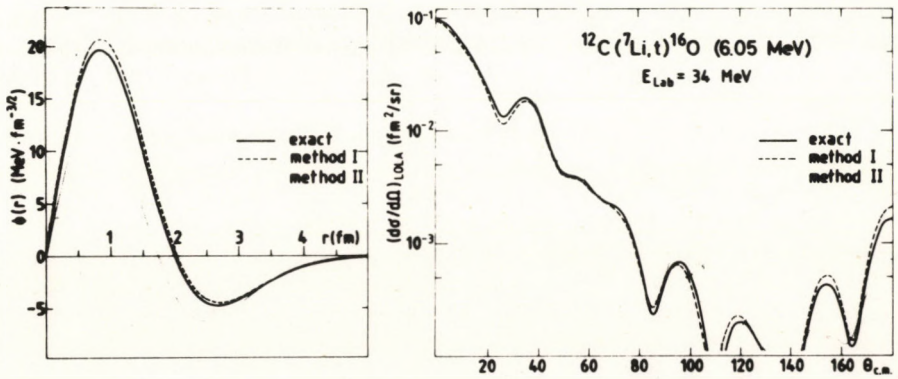
One of the exact procedures is a direct evaluation of (1) in terms of Jacobi coordinates, the other is a double Fourier transformation technique. Both have proved to be feasible. The approximations are simpler in that the only asymmetric expression they involve is $\psi(r)=(a!/b!x!)^{\frac{1}{2}}\langle\phi_b\phi_x|\phi_a\rangle$. They are formulated as

$$\phi(r)\simeq(E_a-\langle H_b\rangle-\langle H_x\rangle-T_{b-x})\psi_0(r) \qquad (I)$$

$$\phi(r)\simeq\Sigma_N\int dS S^2\int dS' S'^2 f^N(S)[V_a(S,S')-\langle V_b\rangle-\langle V_x\rangle]f^0(S')\psi_N(r), \qquad (II)$$

where T_{b-x} is the relative kinetic energy, the expectation values are to be taken for the g.s. of the nuclei concerned, V_a is the potential kernel, and the sum runs over the states N obtained in the diagonalization for a particular spin-parity.

The figures show the exact and approximate ϕ that include in $V_{\alpha-t}$ both the nuclear and the Coulomb term and the resulting $^{12}C(^7Li,t)^{16}O(0^+, 6.05\ MeV)$ cross sections. As we see, method I is extremely accurate. Since the only approximation in it is $H_b\phi_b\simeq\langle H_b\rangle\phi_b$, $H_x\phi_x\simeq\langle H_x\rangle\phi_x$, applied to the left in (1), it can be improved by optimizing the h.o. parameter, and can be generalized to distortion terms. It is thus useful for more complicated cases as well.



PSEUDO-BOUND WAVEFUNCTIONS IN THE GENERATOR-COORDINATE METHOD

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Daresbury Laboratory preprint (DL/NUC) 134T (1981) 33 p.
Journal of Physics A 15 1982 2383-2400.

The method of using square-integrable trial functions for representing resonant and scattering states is adapted to the generator-coordinate description of two-cluster systems. Numerical tests in an exactly soluble two-particle model indicate that the method is suitable for locating a resonance and is surprisingly accurate in predicting scattering phase shifts. The method is shown to be closely related to the Kohn variational scattering formalism used in the framework of the generator-coordinate method.

VARIATIONAL APPROACH TO RESONANT STATES OF MANY-PARTICLE SYSTEMS

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Daresbury Laboratory preprint (DL/NUC) 134T (1981) 29 p.
Annals of Physics, 140 (1982) 29-44.

A variational approach is proposed for the approximate description of decaying states represented by Gamow functions. The method is suited to describing manyparticle systems with antisymmetry. It is shown that, in combination with a generator-coordinate basis, its actual application is as feasibel as an ordinary boundstate generator-coordinate calculation. Model calculations reveal that, as an approximate method, it has very favourable properties.

MICROSCOPIC POTENTIAL OVERLAP FOR (^{7}Li,t) REACTIONS

Pál K. F., Lovas R. G., Vertse T.

Contributions to the International Conference on
Nucleus-Nucleus Collisions, East Lansing,
Michigan, September, 1982

METHODS FOR THE MICROSCOPIC CALCULATION OF THE POTENTIAL OVERLAP IN THE DWBA DESCRIPTION OF MULTIPARTICLE TRANSFER REACTIONS

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Contributions to the International Conference
on Nucleus-Nucleus Collisions, East-Lansing,
Michigan, September, 1982

SHAPE OF THE α POTENTIALS IN THE DISTORTED-WAVE BORN APPROXIMATION DESCRIPTION OF α TRANSFER

B. Gyarmati, K. F. Pál and T. Vertse

Physical Review 26, 1982, pp. 2674-2677

From many cases considered it is concluded that the exact shape of the equivalent deep attractive α-A and α-d potentials does not affect appreciably the distorted-wave Born approximation cross section of the A(^{6}Li,d)B reaction.

LOW-ENERGY PROTON SCATTERING AND THE NUCLEON EFFECTIVE MASS

B. Gyarmati

Institute of Physics, Åbo Akademi, Turku,
October 28, 1982.

ON THE MOMENT OF INERTIA IN DEFORMED BA-XE NUCLEI AS DEDUCED FROM GAMMA-GAMMA ENERGY CORRELATION EXPERIMENTS

Th. Lindblad*, L. Hildingsson**, D. Jerrestam*,
A. Kallberg*, A. Johnson*, C. J. Herrlander*,
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Nuclear Physics A378 (1982) 364-374

The γ-rays following reactions induced by bombarding targets of ^{114,116,118,120,122}Sn with 118 MeV ^{12}C-ions are investigated using six NaI(Tl) detectors in a two-dimensional coincidence arrangement. Experimental energy-correlation spectra are extracted from the original coincidence matrices. The energy-correlation spectra exhibit the features expected for rotational nuclei and are used to deduce information on the moment of inertia $\mathcal{J}^{(2)}=\Delta I/\Delta\omega$. The gross properties of the behaviour of $\mathcal{J}^{(2)}$ in the Ba-Xe region are discussed together with its interpretation within the cranked shell-model (CSM).

GAMMA-GAMMA ENERGY CORRELATIONS AND MOMENT OF INERTIA IN LIGHT XE ISOTOPES

W. Klamra*, J. Bialkowski*, C. J. Herrlander*, L. Hildingsson*,
D. Jerrestam*, A. Johnson*, A. Kerek*, J. Kownacki**, A. Kallberg*,
Th. Lindblad*, C. G. Lindén* and T. Vertse

*Research Institute of Physics, Stockholm, Sweden
**Institute for Nuclear Research, Swierk, Poland

Nuclear Physics A391 (1982) 184-190

GAMOW, A PROGRAM FOR CALCULATING THE RESONANT STATE SOLUTION OF THE RADIAL SCHRÖDINGER EQUATION IN AN ARBITRARY OPTICAL POTENTIAL

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Computer Physics Communications 27 (1982) 309-322

DWBA CALCULATION OF THE CROSS SECTION OF THE $^{12}C(^{6}LI,D)^{16}O^{*}(O_2^{+},6.05MEV)$ REACTION

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*Institute of Physics, Technical University, Budapest, Hungary

Acta Physica Academiae Scientiarum Hungaricae, Tomus 51 (1-2) pp. 171-176 (1981)

Exact finite range DWBA calculation performed for the reaction $^{12}C(^{6}Li,d)^{16}O^{*}/6.05/$ reproduces satisfactorily the 18 MeV experimental cross section and yields a value of 0.17 for the product of the spectroscopic factors. A comparison of the results with two approximate descriptions shows that the finite range effects induce more oscillations in the angular distribution and depress the maxima at medium and backward angles. A finite range correction calculation with 1.5 fm for the finite range parameter is acceptable for describing the experimental data.

THE POTENTIAL SEPARABLE EXPANSION AS APPLIED TO CALCULATING ORBITALS IN A DEFORMED POTENTIAL

B. Gyarmati and A. T. Kruppa

Nuclear Physics A378 (1982) 407-417

It is rigorously proven that solving the one-particle Schrödinger or Sturmian equation with a deformed potential by using a separable expansion of the potential (PSE method) is equivalent to the coupled equation method. Comparisons with various methods that start from spherical bases reveal that the very flexible PSE method combines their main advantages without being inferior from the computational point of view.

INVESTIGATION OF AN APPROXIMATION METHOD BASED ON THE SEPARABLE EXPANSION OF THE POTENTIAL AND ITS APPLICATION TO SINGLE PARTICLE REZONANT STATES

Gy. Wolf

Diploma work, Kossuth University, Debrecen, 1982

QUASIMOLECULAR AND CLUSTER STATES OF LIGHT NUCLEI AS EXAMPLES OF INTERMEDIATE STRUCTURE

J. Cseh

Submitted to Journal of Physics G.

The quasimolecular and cluster states of light nuclei are frequently interpreted in terms of intermediate structure. It means that a group of states of the same spin and parity is thought to be formed by the fragmentation of a simple state. The strength of the interaction that couples the simple state to the background states and the parameters of the simple state are quantities which have great importance from the point of view of the various models.

In the present work some groups of molecular and cluster states of light nuclei have been analysed in order to determine these parameters. In each case selected for this investigation, i.e. the 4^+, 6^+ and 8^+ resonances of the $^{12}C+^{12}C$ system [1], the $\frac{5}{2}^+$ and $\frac{7}{2}^+$ cluster states of ^{19}F [2], and 0^+ resonances from the α scattering on ^{24}Mg [3] and ^{24}Mg [4], the experiment shows evidence for the existence of intermediate structure. The data were analysed with two different methods [5,6], but the results obtained on the two ways are very close to each other in all cases. There are some common features in the results: (i) the spreading always exceeds considerably the escape width, (ii) the average squared matrix elements of the coupling interactions and the average squared level distances are roughly comparable, (iii) the spreading widths (averaged squared matrix elements) are nearly the same for states in the same system of diverse angular momenta.

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ANALYSIS OF FRAGMENTED GQR IN THE ^{24}MG NUCLEUS

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Proceedings of the International Conference
on Nuclear Structure, Amsterdam, 1982, p. 105
KFKI Report 1982-66

The fragments of the isoscalar giant quadrupole resonance (GQR) found in (α,α') reaction in the ^{24}Mg [1] nucleus have been analysed by two different methods developed by MacDonald [2] and Monahan-Elwyn [3]. These methods permit to determine the position, the spreading width and the strength of the simple structure state (doorway state) mixed into the neighbouring more complicated states by the coupling interaction. In this way the parameters of the GQR were determined: the position E_x=18.1 MeV, the spreading width $\Gamma^{\downarrow}$=3.0 MeV and a strength of 75 % of the energy weighted sum rule (EWSR) have been obtained, in good agreement with both of the methods.

The analysis of different reactions exciting the same energy region of the ^{24}Mg nucleus have made possible to compare them and have helped to clarify the question of the correlation between the different channels.

References

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K. van der Borg, M. N. Harakeh, A. van der Woude, Nucl. Phys. A365 (1981) 243
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W. M. MacDonald, Phys. Rev. C20 (1979) 126
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DYNAMICAL SYMMETRIES OF THE U(4) MODEL AND HIGH-LYING STATES IN THE ^{20}NE, ^{28}SI, AND ^{30}SI NUCLEI

J. Cseh

Submitted to Physical Review C

Recently an interacting boson model was proposed by Iachello to describe the nuclear molecular states [1]. This model has U(4) group structure, and hence has two simple limiting cases, called dynamical symmetries. These are characterised by the U(4)⊃O(4)⊃O(3) and U(4)⊃U(3)⊃O(3) group-chains, respectively.

In order to explore the applicability of this model to the states of core +α-particle type, the model spectra have been compared with those obtained from α scattering on ^{16}O, ^{24}Mg and ^{26}Mg [2,3,4]. In the first step [5] the O(4) limit was used for the description, as it is given in Ref. 1. In the second step, after deriving the corresponding formulae, similar comparison was made with the prediction of the U(3) symmetry.

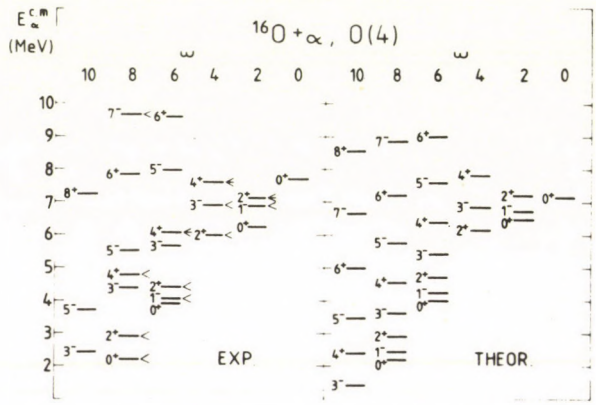

Fig. 1. Comparison between the experimental and theoretical spectrum. The samll crow's feet on the experimental side indicate the fragmentation of the "boson-states" due to some degrees of freedom neglected in this description.

The ^{16}O+α system definitely prefers the O(4) limit, while in the other cases, where the experimental spectra are less complete, there are no such preference.

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L. V. Namjoshi, S. K. Gupta, M. K. Mehta, S. S. Kerekatte, Phys. Rev. C13 (1976) 915
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DYNAMICAL SYMMETRIES OF THE U(4) MODEL AND SOME HIGH-LYING STATES IN LIGHT NUCLER

J. Cseh

Europhysics Study Conference on Nuclear Sturcture, Crete 28 June, 2 July, 1982

NUCLEAR STATES OF CORE+α-PARTICLE TYPE AND THE INTERACTING BOSON MODEL

J. Cseh

Proceeding of 32nd Conference on Nuclear Spectroscopy and Nuclear Structure, 1982, Kiev, Nauka, Leningrád 1982, p. 242
Izv. Akad. Nauk. Ser. Fiz.
(In Russian)

ANALYSIS OF THE ^{24}MG(^{16}O,^{16}O)^{24}MG(2^{+},1.37 MEV) REACTION

T. Papp, J. Cseh, T. Vertse

Submitted to 33rd Conference on Nuclear Spectroscopy and Nuclear Structure, Moscow, 1983.

DESCRIPTION OF THE ^{24}MG(^{16}O,^{16}O)^{24}MG(2+, 1.37 MEV) REACTION IN TERMS OF DIRECT PLUS RESONANCE CONTRIBUTIONS

T. Papp

Diploma work, Kossuth University, Debrecen, 1982
(In Hungarian)

HADRON-NUCLEUS SCATTERING IN THE CONSTITUENT QUARK MODEL

L. Végh., B. Z. Kopeliovich*, L. I. Lapidus*

*Joint Institute for Nuclear Research, Dubna, USSR

Journal of Nuclear Physics 35 (1982) 1514-1529
(In Russian)

An eigen-state method is considered that enables one to account for all the inelastic screening corrections in elastic hadron-nucleus scattering and in the diffraction processes. In the two-component approximation the theory has two parameters - the weight of the active component of the constituent quark and the quark-nucleon interaction cross section. These parameters are determined well from the data on the hadron-nucleus interaction total cross sections. The hadron-nucleus elastic scattering differential cross sections, the real parts of the scattering amplitudes, the three-pomeron coupling, the K_S-meson-nucleus regeneration amplitude are calculated with no free parameters and are in a good agreement with the available experimental data.

RELATIONS BETWEEN POLARIZATION PARAMETERS IN THE PROCESS $NN \rightleftarrows D$

L. Végh, B. Z. Kopeliovich*, and L. I. Lapidus *

*Joint Institute for Nuclear Physics, Dubna, USSR

Journal of Nuclear Physics 36 (1982) 187-196
(In Russian)

Relation connecting the parameters, describing polarization of deuterons in $NN \to d\pi$ process, and the A_{nn}, A_1, A_2 cross section parameters are established. At $\Theta=\pi/2$ the $\langle T_{22}\rangle_{00}$, $\langle T_{21}\rangle_{00}$, and $\langle T_{20}\rangle_{00}$ quantities are given by parameter A_{nn}. The connection between the exact relations and different theoretical approximations is discussed. The proof of the Wilkin relation for the A_{ik} components at $\Theta_\pi=0$, $\pi/2$, π is given in the Appendix.

ON THE FINE STRUCTURE OF THE RMS RADIUS

L. Végh

Proceedings of the International Conference on Nuclear Structure, Amsterdam, August 30-September 3, 1982, Vol I, p. 232.

A NOTE ON CALCULATING STRIPPING TO AN UNBOUND STATE

J. Cseh and B. Gyarmati

Acta Physica Academiae Scientiarum Hungaricae,
Tomus 51 (1-2), pp. 167-169 (1981)

A comparison of the most often used methods for describing stripping to an unbound state has been performed in an exactly soluble (plane-wave + square-well) model. The different methods provide almost identical results only if the unbound state is a background-free, approximately Lorentz-shaped resonance.

EXPLANATION OF INTERNAL CONVERSION ANOMALIES BY GENERALISED EXCHANGE CORRECTION

E. Vatai

Submitted to Nuclear Physics

The analogy with electron capture allows to show that the instantaneous state produced by dinamical correlations is frozen in after internal conversion. Exchange correction, calculated using this final state explains the anomalies of the K/L internal conversion ratios at low atomic numbers and of the L-subshell ratios at medium and high atomic numbers.

A MULTI-CHANNEL MULTI-LEVEL FITTING R-MATRIX PROGRAM

L. Zolnai

ATOMKI Közlemények 24 (1982) 223-227

A multichannel multi-level R-matrix program which is able to fit experimental data measured in channels belonging to different fragmentations is described in this paper.

NUCLEAR PHYSICS

EXPERIMENTAL NUCLEAR PHYSICS

LEVELS OF ^{24}SI FROM THE ^{24}MG(α,α)^{24}MG AND ^{24}MG(α,γ)^{28}SI REACTIONS

J. Cseh, E. Koltay, Z. Máté, E. Somorjai and L. Zolnai

Nuclear Physics A385 (1982) 43-56

Excitation functions have been measured at six angles for ^{24}Mg(α,α)^{24}Mg up to E_α=4.94 MeV. Multi-level R-matrix analysis was performed for nineteen resonances. More than half of the determined spin-parities and other resonance parameters are new values. The ^{24}Mg(α,γ)^{28}Si studies of Maas et al. were extended up to E_α=5.13 MeV. Resonance strengths and branching ratios were determined. The γ-ray angular distribution measurement at E_α=3.79 MeV gives $J^\pi=2^+$ value for the resonance. A comparison of the results obtained in different reaction channels is given and the possibility of clusterisation in some excited states of ^{28}Si is discussed.

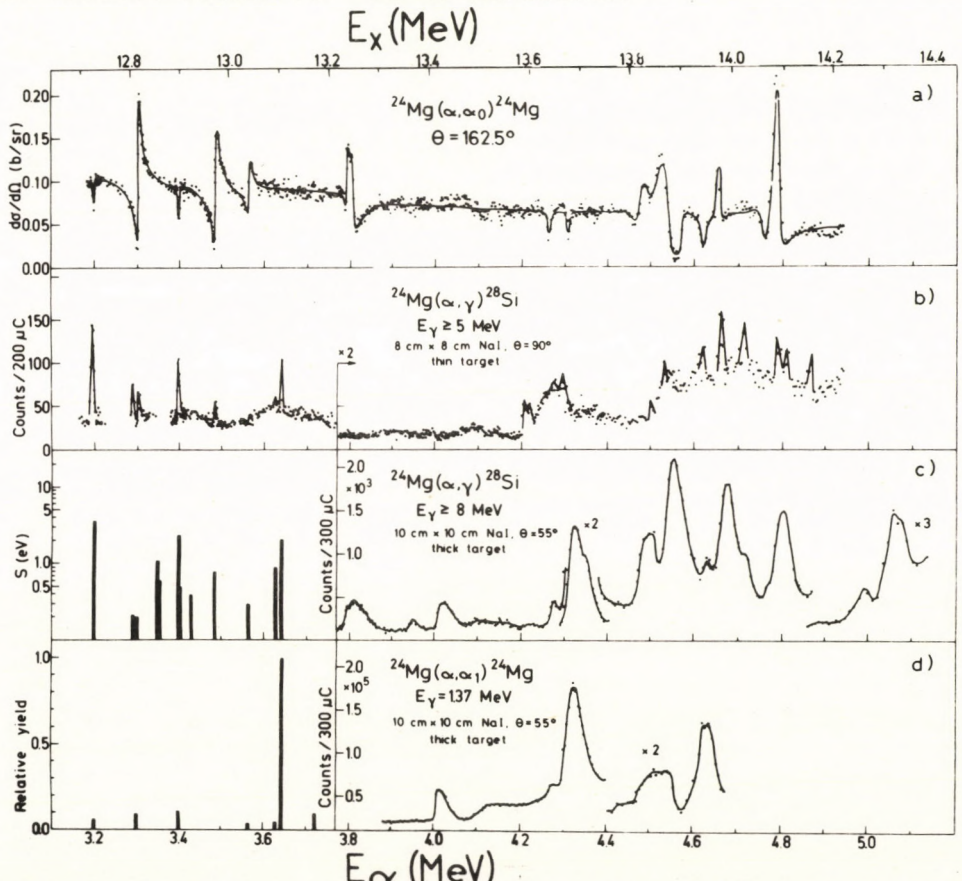

Fig. 1. Comparison of excitation functions of the ^{24}Mg+α processes; (a) elastic scattering, (b) simultaneously measured radiative capture, (c) thick target yield of the radiative capture and (d) of the α_1 channel. The bars in (c) and (d) represent the data given in ref.[1])The solid line is a theoretical curve in part (a), and a guide to the eyes on other parts.

Reference

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$^{24}MG+\alpha$ SCATTERING AND THE IBM FOR NUCLEAR MOLECULAR STATES

J. Cseh, E. Koltay, Z. Máté, E. Somorjai, L. Zolnai

ATOMKI Közlemények 24 (1982) 173-177 No.3.

DSA MEASUREMENT OF SHORT LIFETIMES IN ^{27}Al

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A. Z. Kiss and E. Somorjai

*Department of Physics, University of Helsinki,
SF-00170 Helsinki 17, Finland

Nuclear Physics A385 (1982) 194-203

Lifetimes or upper limits of 17 bound states in ^{27}Al have been measured using the Doppler shift attenuation method applied to the $^{26}Mg(p,\gamma)^{27}Al$ reaction in the proton energy range 1.4-2.2 MeV. For the effective stopping of recoils, the targets were prepared by implanting ^{26}Mg into tantalum backings. The Monte Carlo method and the experimental stopping values were used in the DSA analysis. In the Monte Carlo simulations the scattering angles of recoiling ions were calculated directly from the Thomas-Fermi interaction potential rather than from the LSS theory.

RELATIVE EFFICIENCY OF A GAMMA DETECTOR AND AN APPLICATION OF IT IN NUCLEAR PHYSICS

F. Szelecsényi

Diploma work Kossuth University, Debrecen, 1982
(In Hungarian)

We have investigated the decay of the state at E_x=3783 KeV in the ^{41}Sc nucleus. It is a mirror state of the ^{41}Ca mirror nuclide. According to our result, this state decays directly to the ground state. On the other side in the literature the mirror state in ^{41}Ca decays through intermediate states to the ground state. Conclusion: the states are not mirror states, or the decay data of the ^{41}Ca are incorrect.
We have measured the relative efficiency of the Ge(Li) detector used in the investigation. ^{56}Co-source and gamma-ray cascades of (p,γ) capture reactions were used for this purpose.

THE (P,DD) REACTION ON ^{6}LI AND ^{7}LI NUCLEI AT 670 MEV

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Nuclear Physics A386 (1982) 484-492

The (d,pp) reaction was investigated for ^{6}Li and ^{7}Li nuclei at 670 MeV in a kinematically complete experiment. In transitions to the ground states evidence was found for the quasi-free pick-up process on quasi-tritons; the experimental data were analysed by quasi-free reaction theory. In other transitions the admixture of secondary processes cannot be excluded.

NUCLEAR STRUCTURE AND CHEMICAL EFFECTS IN INTERNAL CONVERSION OF THE 35 KEV M1+E2 TRANSITION IN ^{125}TE

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Zeitschrift für Physik A. 306, 347-351 (1982)

The relative conversion line intensities of the 35 keV transition in ^{125}Te were measured using the 50 cm π2 iron-yoke magnetic spectrometer. The transition was proved to be of M1+(8.7±1.5)x10^{-4}E2 multipolarity, the magnetic component being affected by the nuclear structure with λ=24±1.4. The conversion intensity ratio, O/N_1 was determined to be 0.115±0.005 for both Ag ^{125}I and Cu ^{125}I sources. It is in accordance with previous measurements for the Zn ^{125m}Te and Pb^{125m}Te sources and differs from those for the $^{125m}TeO_2$ and $Na_2H_4{}^{125m}TeO_6$ ones. The conversion coefficients were calculated for 32 configurations of the valence shell of free tellurium atom and ions and were compared with the experimental results.

EXCITED STATES OF ^{98}TC FROM THE ^{98}MO(P,N)^{98}TC REACTION

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Physica Scripta Vol. 26, pp. 57-64, (1982)

γ-spectra and integral γ excitation functions of the ^{98}Mo(p,n)^{98}Tc reaction were measured with Ge(Li) and hyperpure Ge detectors in the 2.4-4.0 MeV energy interval of the bombarding protons. The conversion electron spectrum of the reaction was measured with a superconductiong magnet transporter Si(Li) spectrometer. The level scheme of ^{98}Tc,γ -branching ratios, multipolarity of transitions, level spin and parity values have been deduced. The energies of ^{98}Tc levels were calculated on the basis of the parabolic rule which was derived from the cluster-vibration model. The experimental level scheme of ^{98}Tc has been compared with the available theoretical results.

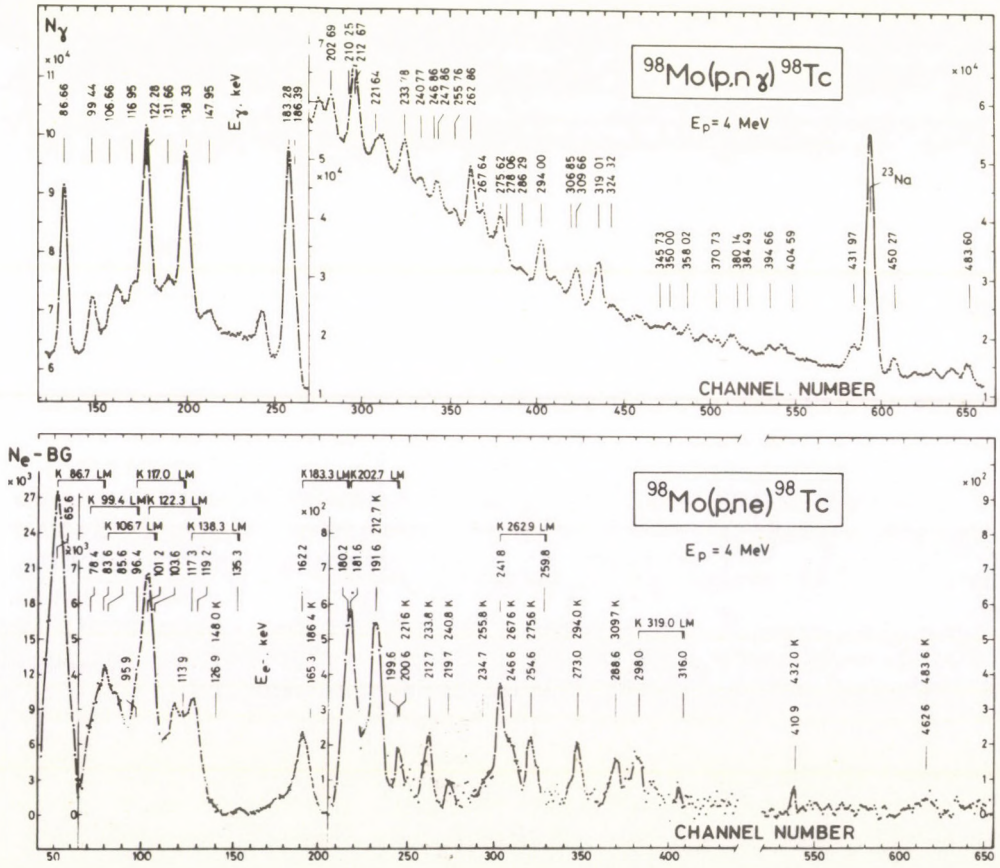

Fig. 1. The γ and conversion electron spectra of the ^{98}Mo(p,nγ)^{98}Tc reaction at 4 MeV bombarding proton energy. The electron background which was very similar for different nuclear reactions was substracted from the electron spectrum.

NUCLEAR SPECTROSCOPIC STUDY OF THE NB NUCLEUS WITH INTERNAL CONVERSION MEASUREMENTS

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PhD Thesis, Kossuth University, Debrecen, 1982.
(In Hungarian)

The conversion electron and γ-ray spectra of the $^{96}Zr(p,n\gamma)^{96}Nb$ reaction were measured with Ge(Li) and superconductiong magnet transporter Si(Li) spectrometers respectively, at 4 MeV bombarding proton energy. The multipolarity of six transitions were determined for the first time. Conclusions were drawn on the spins and parities of the excited states of ^{96}Nb.

The energies of ^{96}Nb levels were calculated on the basis of the parabolic rule derived from the cluster-vibration model. This calculation provided a simple classification of the $\pi g_{9/2}\gamma d_{5/2}^{-1}$ multiplet states in ^{96}Nb. From the coupling of $P_{1/2}^{-1}$ proton and $d_{5/2}^{-1}$ neutron states 2^- and 3^- levels may also arise. The E1 character of the 327.3 keV transition is a strong argument in favour of the presence of lowlying negative parity state in ^{96}Nb.

Some methodical results were also described in the dissertation concerning the background reduction in conversion electron measurements and the preparation of targets from high melting-point materials.

Enriched ^{96}Zr target was used in the experiments.

INVESTIGATION OF THE LEVEL SUTRUCTURE OF THE ^{102}RH NUCLEUS

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PhD. Thesis, Kossuth Universitiy, Debrecen, 1982,
(In Hungarian)

The aim of this thesis was to get information about the unknown level structure of the ^{102}Rh [1] by the method of in-beam gamma-ray spectroscopy.

First the models, describeing characteristic features of transitional nuclei are summarized, and the most important experimental results on the structure of even-even and odd nuclei in the neighbourdhood of ^{102}Rh are surveyed. Using these data the level structure of ^{102}Rh was predicted with the aid of the parabolic rule [2].

The second part describes the equipments and procedures used, including a centrifugal method adopted for target preparation.

The gamma radiations of the ^{102}Ru(p,nγ)^{102}Rh reaction were investigated. The spectra were measured with Ge(Li) and hyperpure Ge detector, using targets enriched in ^{102}Ru and of natural isotope composition. The excitation functions of gamma-rays were determined in 50 keV steps in the 3.20-4.05 MeV proton energy range. The assigment of the gamma rays was based on the isotope ratio and on the shape of excitation functions. The threshold energies of the γ-rays were also determined. A two-parameter γγ - coincidence measurement was also performed in the interest of level scheme construction.

On the basis of the energy and intensity balance of the gamma-rays, coincidence and threshold energy data, as well as data obtained from (p,d) reaction [3] a detailed level scheme is proposed.

References

[1] C. M. Lederer, V. S. Shirley, Table of Isotopes, 7th edition, John Wiley and Sons Inc., New York, 1978.
[2] V. Paar, Nucl. Phys. A331 (1979) 16
[3] K. S. Thorne, E. Kashy, Nucl. Phys. 60 (1964) 35

MULTIPOLARITIES OF ^{76}AS TRANSITIONS FROM THE ^{76}GE(P,Nγ)^{76}AS REACTION

Z. Gácsi, J. Gulyás, T. Kibédi, E. Koltay,
A. Krasznahorkay, T. Fényes

Abstracts of the 32nd Conference on Nuclear Spectroscopy and Structure of Atomic Nuclei, Kiev, March 16-18, 1982, p. 557. Publ. Nauka, Leningrad, 1982.
(In Russian)

γ-ray and internal conversion electron spectra of the ^{76}Ge(p,nγ)^{76}As reaction were measured with Ge(Li) and superconducting transporter Si(Li) spectrometers respectively, at 3.2 MeV bombarding proton energy. The targets were prepared from ^{76}Ge enriched to 94.6 %. Multipolarities of 24 ^{76}As transitions were determined for the first time. Spin and parity values of ^{76}As levels have been discussed. The experimental level scheme has been compared with the results of existing shell model calculations.

ENERGY LEVELS OF ^{96}NB

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Submitted for the Annual Meeting of the Southeastern Section of the American Physical Society 28-30 October 1982
Bull. Am. Phys. Soc.

Nb is of interest because its nuclear structure is particularly simple with relatively isolated multiplets, one of six levels and one of two levels, at relatively low excitation energies. With the objective of identifying other predicted multiplets in this nucleus γ-ray excitation functions, γ-ray energies and intensities, and γ-γ coincidence spectra have been ecquired using the ^{96}Zr(p,nγ)^{96}Nb reaction. Metallic foil targets enriched to 85.3 % and 51.4 % in ^{96}Zr have been bombarded with protons whose energies were varied from just above the threshold (Q=-0.600 MeV) to 5.5 MeV. Additions have been made to the previously-proposed level scheme for ^{96}Nb.[1] Conclusions which can be drawn from the data regarding the level scheme of ^{96}Nb and a comparison with nuclear model calculations will be discussed.

Reference

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THE INVESTIGATION OF THE STRUCTURE OF THE ^{96}NB NUCLEUS

A. Krasznahorkay

PhD Thesis, Kossuth University, Debrecen, 1982
(In Hungarian)

THE INVESTIGATION OF THE STRUCTURE OF THE ^{100}TC IN THE ^{100}MO(P,N) ^{100}TC REACTION

J. Gulyás

PhD Thesis, Kossuth University, Debrecen, 1982
(In Hungarian)

STUDY OF THE EXCITED STATES OF ^{70}GA FROM THE ^{70}ZN(P,Nγ)^{70}GA REACTION

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Diploma work, Kossuth University, Debrecen, 1982
(In Hungarian)

DECAY SCHEME OF ^{153}TB

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Abstracts of the 32nd. Conference on Nuclear Spectroscopy and Structure of Atomic Nuclei, Kiev, March 16-18, 1982, p. 101.
Publ. Nauka, Leningrad, 1982.
(In Russian)

IN-BEAM NUCLEAR SPECTROSCOPIC STUDIES

T. Fényes

Report at the scientific session of the Hungarian Academy of Sciences, Budapest, May 5, 1982.
(In Hungarian)

A survey of the results of the Nuclear Spectroscopy Group of the Institute of Nuclear Research of the Hungarian Academy of Sciences was given.

PROBLEMS OF NUCLEAR STRUCTURE RESEARCH IN JINR (DUBNA)

T. Fényes

Report at the XXXIII Session of the Low Energy Physics Scientific Council of JINR, Dubna. January 13, 1982, USSR
(In Russian)

STUDY OF THE STRUCTURE OF ^{82}BR, ^{76}AS, ^{70}GA NUCLEI

J. Gulyás, T. Fényes, Z. Gácsi
A. Krasznahorkay, T. Kibédi

Report at tha VI. Meeting of the Hungarian Nuclear Physicists, Hajdúböszörmény, June 22, 1982.
(In Hungarian)

THE LEVEL STRUCTURE OF ^{102}RH

Zs. Dombrádi, J. Gulyás,
A. Krasznahorkay

Report at the VI. Meeting of the Hungarian Nuclear Physicists, Hajdúböszörmény, June 22, 1982.
(In Hungarian)

THE STUDY OF SHORT-LIVED NUCLIDES IN THE REGION Z=59-68

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Workshop in YASNAPP programe, Dubna 19-21 October 1982 (In Russian)

Proceedings of the Internal Conference on Nuclear Structure, Amsterdam, 1982 (ed. A. Van Der Woude and B. I. Ver Hoar) V.1, p.264

Submitted to Zeitschrift für Physik A

X-ray, γ-ray, conversion electron and positron spectra have been measured in wide range of mass numbers (A=130-154) at IRIS on-line mass separator facility. The ^{136}Sm (42±4s), ^{137}Eu (10s), ^{145}Dy (18±3s), ^{147}Dy (72±2s) new isotopes and a new isomeric state (5±2s) of ^{131}Pr have been identified. New beta decay data for ^{130}Pr, ^{135}Pm, ^{137}Sm, ^{146}Tb(1+), ^{147}Dy, ^{150,152,154}Er nuclei have been obtained. Endpoint energies of β^+ spectra have been measured for ^{138,140}Pm, ^{143}Sm, ^{141,142m}, ^{143,144}Eu, ^{146,147} Tb, ^{149,150,151,152}Ho nuclei using HP germanium detector.

THE IDENTIFICATION OF THE PROTON DRIP LINE

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Submitted to 33rd Symposium on Nuclear
Spectroscopy and Nuclear Structure, Moscow, 1983
(Nauka, Leningrad, 1982)
(In Russian)

Preprint Leningrad Nuclear Physics Institute,
No.820, 1982, Leningrad

The masses of about 40 nuclides (A≃150-180) far from the beta-stability are derived from the experimental data. These data are deduced from the chains of alpha-decay energies and precision positron end-point energy values for nuclei in the bottom of the alpha-chains. The positron spectra were measured using intrinsic Ge spectrometer.
The Nuclides ^{175}Au, ^{176}Au, ^{177}Au, ^{169}Ir, ^{170}Ir, ^{171}Ir, ^{165}Re, ^{166}Re and, possibly, ^{161}Ta are found unstable toward direct proton decay. The proton drip line has been identified.

The proton pairing energies Δ_p - determined as even-odd mass differences - increase for the isoton nuclei when the proton number Z is increased. The values of Δ_p for isoton nuclei in the neighbourhood of the proton drip line are about 50 % larger than for beta-stable nuclei. The regular behaviour of Δ_p is emphasized for all investigated cases.

NEW NEUTRON DEFICIENT ISOTOPES WITH MASS NUMBERS A=136 AND 145

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Zeitschrift für Physik A305 (1982) 185-186

Previously unobserved nuclei of ^{136}Sm($T_{\frac{1}{2}}$=42±4 s) and ^{145}Dy($T_{\frac{1}{2}}$=18±3 s) have been identified using an on-line mass separating facility, operating on a 1 GeV proton beam.

SHORT-LIVED NEUTRON DEFICIENT NUCLEI OF A=147 ISOBARS

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p. 90
(In Russian)

New γ-lines were observed following the decay of $^{147m+g}$Dy and new multipolarities were determined for transitions using the on-line mass separator IRIS and γ - and conversion electron spectrometers.

SHORT-LIVED NEUTRON DEFICIENT NUCLEI OF ISOBARS A=135 AND 136, NEW ISOTOPE ^{136}SM

G. D. Alkhazov[1], V. P. Afanasyev[2], N. Ganbaatar[3], K. Ya. Gromov[2], V. G. Kalinnikov[2], J. Kornicki[4], A. Latuszynski[5], K. A. Mezilev[1], Yu. N. Novikov[1], V. N. Panteleyev[1], A. G. Polyakov[1], A. Potempa[4], J. Sieniawski[4], F. Tárkányi, Yu. V. Yushkevich[2]

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p. 78
(In Russian)

The new nucleus ^{136}Sm($T_{\frac{1}{2}}$=42±4s) was identified. In the decay of the ^{136}Sm and the ^{135}Pm ($T_{\frac{1}{2}}$=55s) 15 and 32 γ lines have been observed, respectively. Preliminary decay scheme was proposed for ^{135}Pm.

NEW ISOTOPE ^{145}DY

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p.85
(In Russian)

The new isotope ^{145}Tb ($T_{\frac{1}{2}}$=29.5±1.5 s) has been identified using the on-line mass-separator facility IRIS by measuring the x-ray and γ-ray spectra of the daughter nucleus formed as a result of EC+β^+ decay.

NEW NUCLEI OF THE A=150 ISOBARS AND IDENTIFICATION OF THE ^{152}TM

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p.95
(In Russian)

Neutron deficient nuclei of the A=150 and 152 isobars were investigated. The new isotope ^{150}Er ($T_{\frac{1}{2}}$=17 s) and new isomeric state ^{150m}Ar ($T_{\frac{1}{2}}$=84 s) were found. For ^{152}Tm nucleus ($T_{\frac{1}{2}}$=5 s) the identification was confirmed.

DECAY OF $^{150-154}$ER AND $^{148-154}$HO ISOTOPES

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Bull. Acad. Sci. USSR Phys. Ser., 46 (1982) 2200
(In Russian)

The decay of the short-lived $^{148-154}$Ho and $^{150-154}$Er isotopes have been investigated using the mass-separator facility IRIS working on-line with the proton beam of 1 GeV. The x-ray, γ-ray and conversion electron spectra were measured. The ^{150m}Ho isomeric state has been identified ($T_{\frac{1}{2}}$=84±10 s). The gamma line with energy of 476.0 keV and half-life of $T_{\frac{1}{2}}$=17±2s has been assigned to the new ^{150}Er isotope. The ^{151}Er isotope was identified directly via its EC+ β+decay. Decay schemes have been constructed for the investigated ^{151}Ho, ^{152}Ho, ^{153}Ho and ^{154}Er nuclei. On the basis of analogy with $^{148-152}$Dy decay preliminary decay schemes are proposed for ^{150}Er and ^{152}Er too. The relative values of matrix elements for the observed Gamov-Teller β transitions indicated the similar structure of these six Ho and Tb nuclei.

DECAY OF SHORT-LIVED ISOTOPES $^{151-154}$ER

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p. 98
(In Russian)

The decay properties of the $^{151\text{-}154}$Er nuclei were investigated via X-ray, γ-ray, and conversion electron measurements. On the basis of the observed transitions the Er(0^+) —β+→ Dy(1+) —γE1→ Dy(2^-) decay scheme is proposed for the even ^{150,152,154}Er nuclei.

DECAY OF THE ^{150,152,154}ER NUCLEI

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32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 16-18 March 1982
(In Russian)

BETA-DECAY ENERGIES OF ^{143}EU, ^{145}GD AND ^{149}DY NUCLEI

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Submitted to 33nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Moscow, 1983
(In Russian)

BETA-DECAY ENERGY OF ^{147}TB, ^{148}TB AND ^{148}DY ISOTOPES

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Proceedings of 32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 1982 (Nauka, Leningrad, 1982) p.91 (In Russian)

The endpoint energies of positron spectra have been measured using hyperpure Ge detector and stilben-Ge(Li) coincidence technique at on-line mass-separator facility IRIS. The Q_{EC} values for β decay of ^{147}Tb, ^{148m}Tb(2.2 min) and ^{148}Dy have been obtained to be 5100±120 keV, 5870±80 keV and 2660±60 keV respectively.

BETA-DECAY ENERGIES OF ^{147}TB, ^{148}TB, ^{148}DY

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Submitted to: Bull. Acad. Sci. USSR Phys. Ser. (In Russian)

THE NEW ISOTOPE ^{137}EU. DECAY OF ^{137}SM ISOTOPE

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Submitted to: 33rd Symposium on Nuclear Spectroscopy and Nuclear Structure, Moscow, 1983 (Nauka, Leningrad, 1982) (In Russian)

NEW ISOTOPES ^{136}SM AND ^{145}DY

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32nd Symposium on Nuclear Spectroscopy and Nuclear Structure, Kiev, 16-18 March 1982
(In Russian)

NEW ISOMERIC STATES IN ^{131}PR, ^{138}PM, ^{146}TB ISOTOPES

N. Ganbaator[1], J. Kormicki[2], K.A. Mezilev[3], Yu.N. Novikov[3], A.M. Nurmukhamedov[3], A. Potempa[2], J. Sieniawski[2], F. Tárkányi

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(In Russian)

EXCITED STATES OF THE ^{147}TB ISOTOPE

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Submitted to 33rd Symposium on Nuclear Spectroscopy and Nuclear Structure, Moscow, 1983
(In Russian)

MASS DIFFERENCE MEASUREMENTS IN RARE-EARTH NUCLEI FAR FROM THE BETA STABILITY

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Submitted to 33rd Symposium on Nuclear Spectroscopy, and Nuclear Structure, Moscow, 1983
(In Russian)

PURE GAMOW-TELLAR TRANSITIONS 0^+-1^+ IN THE DECAY OF YB, ER DY NUCLEI

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Submitted to 33rd Symposium on Nuclear Spectorscopy and Nuclear Structure, Moscow, 1983
(In Russian)

CONVERSION ELECTRON MEASUREMENTS IN THE DECAY OF SHORT-LIVED HO NUCLEI

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Submitted to 33rd Symposium on Nuclear Spectroscopy and Nuclear Structure, Moscow, 1983
(In Russian)

INNER-SHELL REARRANGEMENT (EXCHANGE CORRECTION) IN INTERNAL CONVERSION

E. Vatai

Inner-Shell and X-ray Physics of Atoms and Solids.
Proceedings of the Interantional Conference on X-ray
Processes and Inner-Shell Ionization, August 25-29, 1980.
Stirling, Scotland, Eds. D.J. Fabian, H. Kleinpoppen,
L.M. Watson. New York, 1981, Plenum Press. pp 305-308

DEVELOPMENT OF HIGH-SENSITIVITY TRACK DETECTORS AND STUDY OF THE HIGH-ENERGY HEAVY-ION COMPONENT OF COSMIC RAYS

G. Somogyi

Report at the scientific session of the Medical-Biological
Comittee of the Intercozmos Council of the Hung. Acad. of Sci.,
Budapest, February 11, 1982
(In Hungarian)

ATOMIC PHYSICS

A STUDY OF THE ANGULAR DISTRIBUTION OF THE ELECTRONS IN THE PEAK NEAR $v_e=v_i$ IN THE ELECTRON SPECTRA FROM He^+, H_2^+-Ar COLLISIONS

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S. Ricz, J. Végh and G. Hock

Submitted to Journal of Physics B

The peak near $v_e=v_i$ in the electron spectra from He^+ (0.8 MeV/amu), H_2^+ (0.8 MeV/amu; 1.995 MeV/amu) - Ar collisions was studied at thirteen angles from 0° to 180°. The experimental values for the position and half width (FWHM) of these peaks were compared with theoretical calculations. An example is given for the comparison of the actual shapes of the peak for different projectiles with the corresponding theoretical curves. The angular distribution of the electrons in the electron loss peak (i.e. the single differential cross section) was plotted together with the theoretical ones.

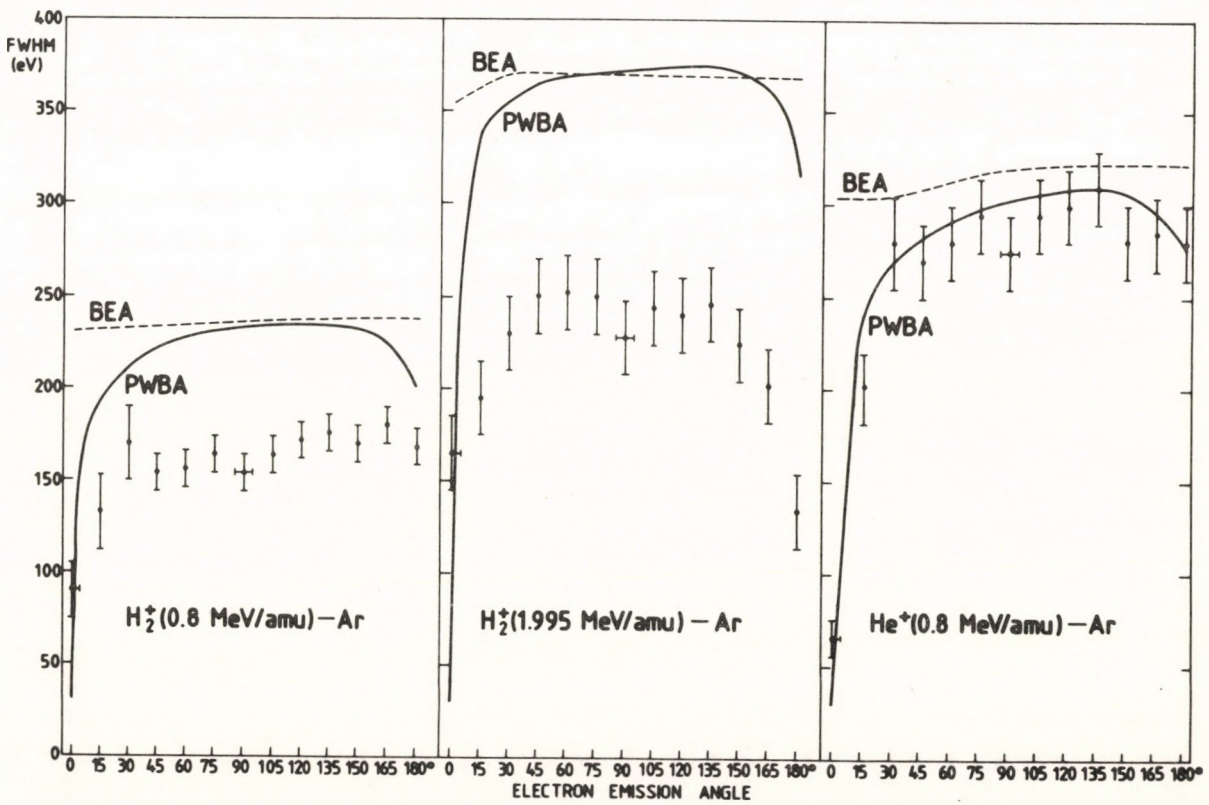

Fig. 1. Dependence of the full width at the half maximum (FWHM) of the $v_e=v_i$ peak on the electron emission angle.

ANGULAR DISTRIBUTION OF ELECTRONS EJECTED FROM THE ARGON L SHELL BY 350 KEV PROTON IMPACT

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Submitted to Journal Physics B

The contribution of the L shell to the total δ-electron ejection cross sections in argon by 350 keV proton bombardment has been measured. The L electrons were discriminated from the other electrons by detecting coincidences with the L-MM Auger electrons. The primarily measured quantity was the ratio of the number of coincidences to the number of the detected continuum electrons at a given ejection energy ε and angle ϑ_e. From this quantity the ratio of the doubly differential cross section (DDCS) for the L shell to that for the total electron ejection has been determined. We have converted these relative L-shell DDCS data into absolute ones by multiplying them with the total DDCS values measured by Gabler et al. [1]. The results were compared with PWBA calculations with both hydrogen-like and self consistent Hartree-Fock/Hartree-Slater [2] wave functions for the target atom. A reasonable agreement has been obtained with the self consistent field calculations when an additional ionization process, namely the electron capture from the target to the continuum states of the projectile has been included in the form of a correction factor [3].

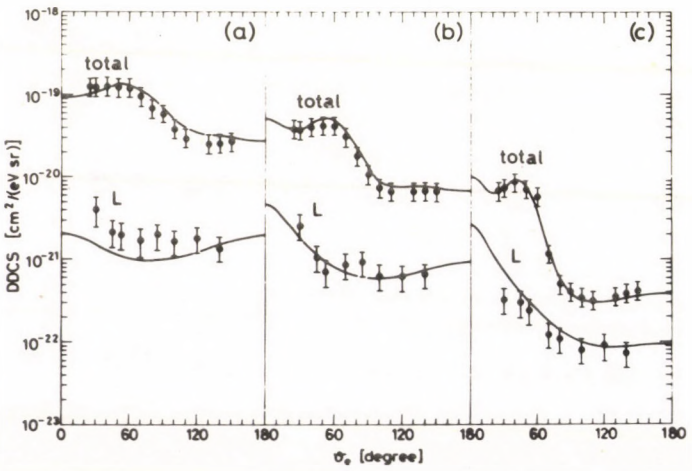

Fig. 1. Total and L-shell doubly differential cross sections for δ-electron ejection at 350 keV proton-impact ionization of argon. Electron energies: ε=(a) 46 eV, (b) 100 eV, (c) 308 eV.

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STUDY OF THE L-SHELL IONISATION OF GOLD BY 3.0-18.2 MEV NITROGEN-ION BOMBARDMENT

J. Pálinkás, L. Sarkadi, B. Schlenk, I. Török, Gy. Kálmán,
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Submitted to Journal Physics B

The angular distribution of the absolute intensities of the L x-ray lines of gold at nitrogen ion impact has been measured. The experiments were performed at the 5 MV tandem accelerator of the Central Institute of Nuclear Research, Rossendorf. Thin targets were bombarded in a small scattering chamber, and the emitted x-rays were detected by a Kevex Si(Li) detector. The scattered projectiles were detected simultaneously by an SB detector.

From the measured x-ray production cross sections of the L_α, $L_{\gamma 1}$ and $L_{\gamma 2,3,6}$ lines the L_1-, L_2- and L_3-subshell ionization cross sections have been determined and compared to the predictions of the CPSSR theory of Brandt and Lapicki (1979) and that of the two-step model of Sarkadi and Mukoyama (1980). The CPSSR theory grossly underestimates σ_{L_2} at low energies. The two-step model improves the agreement between theory and the experiment but still serious deviation remains.

At each bombarding energy the angular distribution of the L_ℓ line has been used to determine the L_3-subshell alignment parameter, which are displayed in figure 1. as a function of the square of the projectile velocity (v_p) relative to the average velocity of the L_3 electrons ($\langle v_{L_3} \rangle$). The experimental data grossly deviate from theoretical results. Clarifying the disagreement the multiple ionization, the electron capture and molecular-orbital processes should be mentioned in addition to the higher order effects.

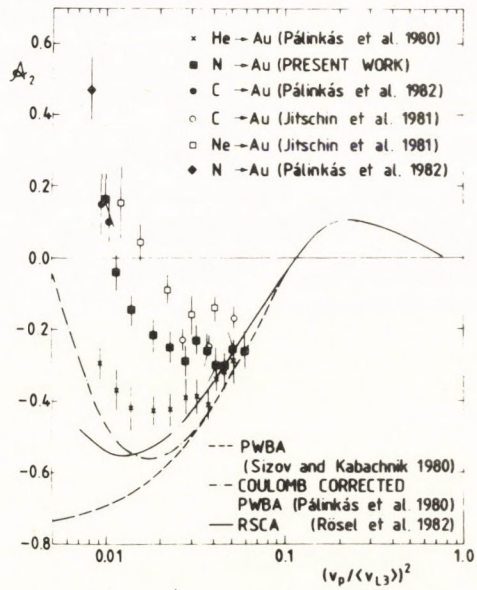

Fig. 1. The alignment parameter A_2 for the L_3-subshell of gold.

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L_3-SUBSHELL ALIGNMENT OF GOLD BY C^+ AND N^+ IMPACT IONISATION

J. Pálinkás, L. Sarkadi, B. Schlenk, I. Török
and Gy. Kálmán

Journal Physics B 15 (1982) L451-454

Int. Conf. on X-ray and Atomic Inner-Shell Physics, August 23-27, 1982. University of Oregon, Eugene, Oregon, USA. Program and Abstracts. p.104.

Measurements of the L_3-subshell alignment of gold by low velocity C^+ and N^+ impact are reported. The alignment parameter has been found to be positive and it is surprisingly large (A_2=0.47±0.09) for 2.4 MeV N^+ ions.

L-SHELL IONIZATION OF GOLD BY NITROGEN-ION IMPACT

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Submitted to Seventh Conference on the Application of Accelerators in Research and Industry, Denton, Texas, USA, November 8-10 1982
IEEE Transactions on Nuclear Science

Measuring the angular distributions and the absolute intensities of the L x-ray lines of gold at 2.4-18.2 MeV nitrogen ion impact, the absolute subshell ionization cross-sections and the alignment parameter of the L_3-subshell have been determined and compared to the theoretical results.

PRIMARY ELECTRON EJECTION FROM THE L SHELL OF ARGON BY PROTON-IMPACT IONIZATION

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8th Int. Conf. on Atomic Physics, Aug. 2-6, 1982, Göteborg, Sweden, Abstracts of Papers, B 52

L_3-SUBSHELL ALIGNMENT OF HEAVY ATOMS IN ASYMMETRIC ION-ATOM COLLISIONS

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Submitted to Int. Conf. on X-Ray and Atomic Inner Shell Physics (X-82), August 23-27, 1982, Eugene, Oregon, USA

Inner-shell ionization by light ions is commonly described by first order perturbation theories (PWBA, SCA). In order to test these models, measurements of the relative ionization cross sections for the different magnetic L_3 substates have been performed. Their relative difference, i.e. the alignment parameter was derived from the anisotropic emission of the characteristic X-ray lines. For proton impact the alignment was found to be sensitive to the Coulomb deflection of the projectile in the field of the target nucleus. For heavier projectiles PWBA calculations predict the same alignment as for protons. Since for these ions the charge-to-mass ratio is smaller, the correction for Coulomb deflection is of minor importance. The experimental data for heavy projectiles ($2 \leq Z_1 \geq 16$), however, show large discrepancies to the theoretical predictions which increase with increasing Z_1. A possible explanation for these results is the strong perturbation of the target atomic wavefunctions.

ELECTRONIC RELATIVISTIC EFFECTS IN K-SHELL IONIZATION BY PROTON IMPACT

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Submitted to Physical Review A

The relativistic plane-wave Born-approximation calculations have been performed for K-shell ionization by proton impact. The K-shell ionization cross sections have been obtained by the use of relativistic hydrogenic (Dirac) wave functions for target electrons. The ratio of the relativistic cross section to the nonrelativistic one is evaluated and compared with various approximate correction methods for the electronic relativistic effects. Similar comparison is made for the K-shell ionization cross sections corrected for binding-energy and Coulomb-deflection effects. These results are also compared with the experimental data.

RELATIVE INTENSITY RATIOS FOR L-SHELL X-RAYS BY LOW-ENERGY PROTON IMPACT

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Nuclear Instruments and Methods, 197 (1982) 585-590

Comparison between theoretical and experimental values for relative intensity ratios of L-shell X-rays by low-energy proton impact E_p=0.3-0.8 MeV has been made graphically. The calculations for the L_α, L_β and L_γ X-ray production cross sections have been performed by the relativistic plane-wave Born approximation theory corrected for the binding-energy and Coulomb-deflection effects (PRWBA-BC). The theoretical predictions are compared with the experimental values for the L_α/L_β and L_α/L_γ X-ray intensity ratios as well as other theoretical models. It is found that the RPWBA-BC gives the best overall agreement with the experimental results. Using an average reduced velocity parameter, we have plotted the experimental L_α/L_β and L_α/L_γ ratios, normalized to the RPWBA-BC theory, for different target elements. This universal plot shows that the measured L_α/L_β and L_α/L_γ values are in agreement with the RPWBA-BC theory within a deviation of 25 %.

L-SHELL COULOMB IONIZATION

L. Sarkadi

Presented on the International Workshop on Cross Sections for Fusion and Other Applications, Nov. 4-6, 1982, College Station, Texas, USA.

Submitted to Nuclear Instruments and Methods

A brief review of the most important features of the L-shell ionization of atoms by charged particle impact is given. For example, the manifestation of the extra node of the $2s_{\frac{1}{2}}$ radial wavefunction in the energy dependence of the L_1 subshell ionization cross section, the consequences of the closely situated wavefunctions of the three subshells (in space and energy), and the phenomenon of the alignment of the L_3 subshell are discussed. It is shown that the direct Coulomb theories successfully describe the ionization processes as far as the perturbing effect of the projectile is small, e.g. for electron and proton impact. For stronger perturbations induced by low velocity heavy ions, however, serious disagreement has been observed between the experimental cross section data and the theoretical predictions [1]. In this case the comparison of the data with simplified second order perturbation calculations [2] indicates that the ionizations of the individual atomic L sublevels are not independent processes.

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TWO COMPUTER CODES FOR K- AND L-SHELL IONIZATION CROSS SECTIONS IN THE PLANE-WAVE BORN APPROXIMATION

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Bull. Inst. Chem. Res., Kyoto, Univ., 60 (1982), 67

Two computer codes for the K- and L-shell ionization cross sections by heavy charged-particle impact in the plane-wave Born approximation are presented. These codes are the modified versions of the computer code DEKY written by us. One of them, called DEKY2, calculates the relativistic cross sections based on the correction recently derived by Brandt and Lapicki and the corrections for the binding-energy and Coulomb-deflection effects are also included. The second code, DEKY3, includes the correction for polarization effect in addition to all the corrections mentioned above and is useful for intermediate- and high-velocity projectiles.

L-SHELL X-RAY PRODUCTION CROSS SECTIONS BY LOW-ENERGY PROTONS

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Submitted to Nuclear Instruments and Methods

Partial L-x-ray production cross sections for low-energy proton bombardments have been calculated in the relativistic plane-wave Born approximation, including the corrections for the Coulomb-deflection and binding-energy effects. The obtained results are compared graphically with the experimental values for L_α, L_β, L_γ and L_l x-ray production cross sections. The experimental data for various target elements are expressed as a ratio to the theoretical value and plotted against an average reduced velocity parameter. This plot shows an approximately universal behaviour for different target elements and for different partial x-ray production cross sections. The agreement between theory and experiment is in general not so good in low-energy region. The reason for better agreement in the case of relative x-ray intensity ratios and correlation between subshell ionization cross sections and partial x-ray production cross sections are discussed.

APPROXIMATE RELATIVISTIC CORRECTION FACTORS IN L-SHELL IONIZATION

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Journal Physics B 15 (1982) L617

Simple approximate correction factors for electronic relativistic effects in L-shell ionization cross sections by low-energy charged-particle impact have been derived in the manner similar to the method of Amundsen et al. [1] for K-shell ionization. At low projectile energies the cross section is proportional to the square of

$$F(q_o) = \int_0^\infty R_f^*(r) R_i(r) j_L(q_o r) r^2 dr,$$

where q_o is the minimum momentum transfer, $R_i(r)$ and $R_f(r)$ are the radial electron wavefunctions for initial and final states, and $j_L(x)$ is the spherical Bessel function of order L.
The correction factor for L_i-shell ionization cross section is given by

$$\sigma_i^R / \sigma_i^{NR} \approx |F_i^R(q_o)/F_i^{NR}(q_o)|^2.$$

In this expression the wavefunctions for the final continuum states have been approximated by simple functions. The factors are compared with relativistic PWBA calculations using Dirac wavefunctions [2] and with other approximate correction methods. In the energy range of interest, the present method is found to represent well the relativistic effects.

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APPROXIMATE CORRECTION FACTORS FOR ELECTRONIC RELATIVISTIC EFFECTS IN L-SHELL IONIZATION

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Int. Conf. on X-Ray and Atomic Inner Shell Physics (X-82)
Aug. 23-27, 1982, Eugene, Oregon, USA

L-SHELL IONIZATION BY LOW-ENERGY PROTONS AND ALPHA PARTICLES

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Nuclear Instruments and Methods 190 (1981) 619-626

Comparison between theoretical and experimetal values for L-subshell ionization cross sections by low-energy protons and α particles has been made graphically. The theoretical values are calculated by the relativiatic PWBA including the corrections for the binding energy and Coulomb-deflection effects. The experimental data expressed as a ratio to the calculated values and plotted against a reduced velocity parameter. It is found that agreement between theory and experiment is not so good as in the case of the K-shell ionization cross sections. For L_1 and L_3 subshell, most experimental data are in agreement with the calculated values within errors of 60 %. However, the measured values for L_2-subshell are systematically larger than the calculated ones. Possible reasons for the discrepancy are discussed.

HELIUM-INDUCED L-SHELL IONIZATION CROSS SECTIONS

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Submitted to Nuclear Instruments and Methods

Comparison between theoretical and recent experimental values for helium-induced L-subshell ionization cross sections has been made graphically. The theoretical predictions are calculated by the relativistic plane-wave Born-approximation, corrected for the effects of increased binding energy and Coulomb deflection. The experimental data for various target elements are normalized to the corresponding theoretical values and plotted against an effective reduces velocity parameter. For L_1 and L_3-shell electrons, satisfactory agreement between theory and experiment is obtained. The calculated values for L_2-shell ionization cross sections are systemetically smaller than the measured values. Possible reasons for the discrepancy are discussed.

AUGER ELECTRON SPECTROMETRY OF BEAM-FOIL EXCITED MOLECULAR HEAVY IONS

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Nuclear Instruments and Methods 194 (1982) 311-313

The influence of the Coulomb explosion of molecular projectile ions on Auger lineshapes is calculated by an analytical and a numberical procedure. The results obtained describe the experimental data better then the previously used Gaussian lineshapes.

Z^2 SCALING AND EFFECTIVE Z OF THE PROJECTILE IN H_2^+, HE^+-AR COLLISIONS

A. Kövér, Gy. Szabó, D. Berényi, D. Varga, I. Kádár, S. Ricz, J. Végh

Physics Letters A89 (1982) No.2 pp. 71-74.

A RESEARCH PROGRAM FOR ION-ATOM COLLISIONS AT HIGH ENERGY

D. Berényi

High Energy Ion-Atom Collisions. Proceedings of the International Seminar on High-Energy Ion-Atom Collision Processes, Debrecen, Hungary, 17-19 March 1981. Budapest, 1982, Akadémiai Kiadó, pp. 131-140. (Nuclear Methods Monographs 2.)

L-SHELL IONIZATION OF GOLD BY HEAVY-ION IMPACT

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Inner-Shell and X-ray Physics of Atoms and Solids. Proceedings of the Int. Conf. on X-ray Processes and Inner-Shell Ionization, August 25-29, 1980, Stirling, Scotland.
New York, 1981, Plenum Press, pp. 27-30.

K-SHELL IONIZATION CROSS-SECTIONS BY LOW-ENERGY CHARGED PARTICLES

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Inner-Shell and X-ray Physics of Atoms and Solids, Proceedings of the Int. Conf. on X-ray Processes and Inner-Shell Ionization, August 25-29, 1980, Stirling, Scotland. 1981, Plenum Press, pp. 17-20.

ELECTRONS AND X-RAYS FROM HIGH-ENERGY ION-ATOM COLLISIONS

D. Berényi

Int. Conf. on X-ray and Atomic Inner Shell Physics, University of Oregon, Eugene, Oregon, USA, August 23-27, 1982.

THE SHAPE OF THE PEAK NEAR $v_e=v_i$ IN THE SPECTRA OF ELECTRONS FROM PROJECTILES HAVING ONE ELECTRON

D. Berényi

Int. Conf. on X-ray and Atomic Inner Shell Physics, August 23-27, 1982. University of Oregon, Eugene, Oregon, USA, Programm and Abstracts pp. 102-103.

THE SHAPE OF THE PEAK NEAR $v_e=v_i$ IN THE SPECTRA OF ELECTRONS FROM PROJECTILES HAVING ONE ELECTRON

D. Berényi, Á. Kövér, D. Varga, Gy. Szabó, I. Kádár, S. Ricz, and J. Végh

Int. Conf. on X-Ray and Atomic Inner Shell Physics, University of Oregon, Eugene, Oregon, USA, August 23-27, 1982.

INVESTIGATION OF INNER-SHELL IONIZATION BY ELECTRON IMPACT IN THE 60-600 KEV ENERGY REGION

K. Kiss

PhD Dissertation, Kossuth University, Debrecen, 1982 (In Hungarian)

ANALYTICAL APPLICATIONS

(APPLIATION OF ATOMIC AND NUCLEAR
ANALYTICAL METHODS IN INDUSTRY,
AGRICULTURE, MEDICINE, BIOLOGY ETC.)

THE ANALYTICAL APPLICATION OF PROTON INDUCED X-RAY EMISSION

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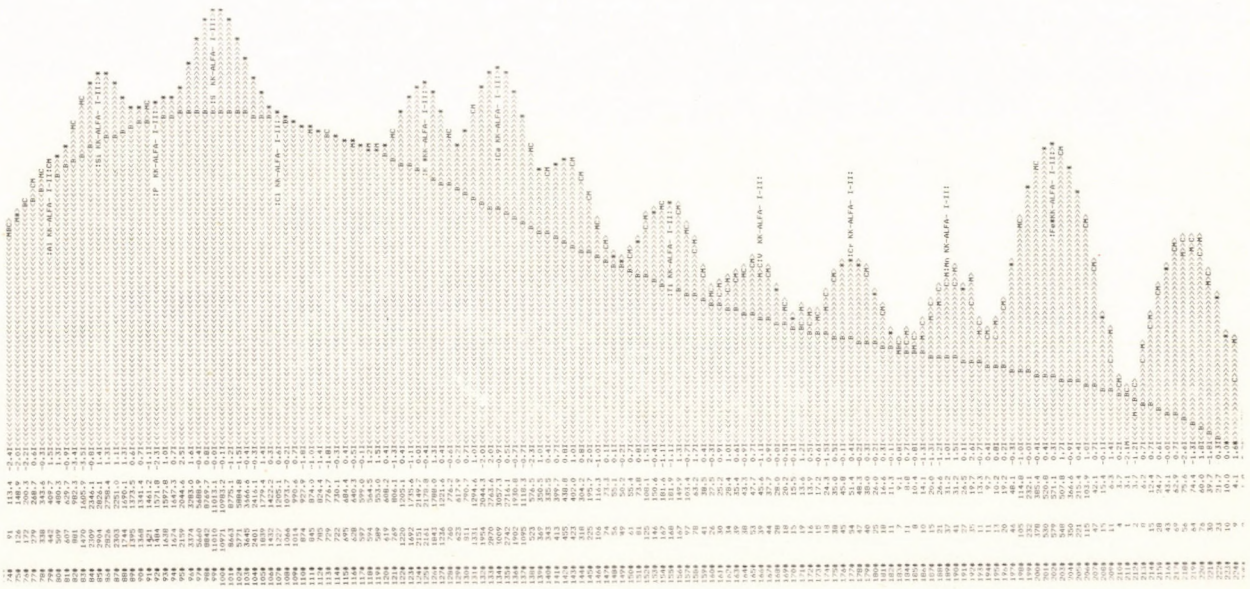
Conference on Hungarian Electron Microscopyc and Microanalysis
Eger, 29-31 March 1982. Abstract p. 74.

Submitted to Mikroskopie (Austria)

Particles accelerated in the 5 MV Van de Graaff accelerator bombard the samples inside a semiautomatic PIXE chamber. X-ray spectra taken by a Si(Li) detector are stored and processed in a system composed of multi-channel analyzer and a PDP-8/I computer. Codes REV-5S and PIXE running on a PDP-11/40 computer are used for evaluating spectra (an example for a fitted spectrum containing 12 elements is given on figure) and for determining absolute elementel concentrations, respectively. Code STAT performs statistical data analysis to result in regression curves correlation coefficients and different statistical tests etc. in the case of similar samples showing up strong statistical fluctuations in the elemental concentrations.

Human blood samples were prepared by lyophilization or by depositing measured micro-quantities of liquid sample on foils streched on a rotating table. Atmospheric aerosol samples were collected by pumping air of a given volume through a cascade impactor to deposite particle fractions of different sizes on the impactor foils or by using NUCLEPORE filter for collecting samples without resolving the different size fractions.



CHANGES OF ELEMENTAL CONSTITUENTS OF BLOOD FOLLOWING COBALT THERAPY INVESTIGATED BY PIXE METHOD

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XII. Conference on Hungarian Electron Microscopy and Microanalysis
Eger 29-31 March 1982. Abstract p. 60.

Submitted to: Mikroskopie (Austria)

In a series of PIXE measurements on blood samples taken from mice undergoing radiotherapy Bearse et al. found changes in the concentrations of elemental constituents not directly correlated with the depression of red blood cell count.

The aim of present investigation was to perform PIXE elemental analysis on human samples of blood plasma and erythrocyties to see the effects in practical cases of human radiotherapic treatment. Two patients undergoing postoperative Gamma irradiation following mastectomy were selected for the investigation.

The analytical measurements were done on pellets formed from lyophilized an powdered blood plasma and red blood cell using the proton beam and the PIXE set-up of the Van de Graaff laboratory in the Institute of Nuclear Research in Debrecen. The eventual prompt effects of the irradiation on the elemental composition of the peripheral blood were followed by four sets of analyses during the irradiation periode, while prolonged effects were examined in samples taken seven and ten months after the end of irradiation. Under the used conditions of irradiation no change were found in the concentrations of elemental constituents in contrast to these found in the above mentioned case.

PIXE ANALYSIS IN OBSTETRICS

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XII. Conference on Hungarian Electron Microscopy and Microanalysis Eger 29-31 March 1982. Abstract p. 27.
Submitted to: Mikroskopie (Austria)

The analysis of trace and practical elements in pregnancy will definately open as new chapter in Perinatology research in the near future. The aim of these analysis is to determine:

1. whether these elements play any role in intrauterine development or not.
2. whether or not, they have toxic effect on the foetus
3. whether there is relation between change in their concentrations and the Foetoplancental unit function.

The authors used a PIXE analytical method to determine the concentration of some trace and practical elements in human red bloodcells (RBC) and blood plasma samples from normal and pathological pregnancies. Determination of concentration of these elements in both the red bloodcells and the plasma, however has a better result than only determination from the serum. Interaction by these elements can also be determined by this method.

Blood samples were received from 11 diabetic and 17 non diabetic pregnant women in 51 and 43 occasions between 30 and 40 gestational weeks. The samples were lyophilizated, later on Yttrium was added to them as internal standard.

From the plasma 10 and from the red bloodcells 9 elements were quantitatively determined. Statistical evaluation showed the difference in concentrations of some elements between the diabetic and non diabetic pregnant women is significant in both plasma and red bloodcells.

The authors emphasise that due to little amount of samples received the above mentioned results can not be used for clinical application or practice; to this extent more examinations and analysis are needed.

PIXE ANALYSIS OF ATMOSPHERIC AEROSOL SAMPLES

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XII. Conference on Hungarian Electron Microscopye and Microanalysis
Eger 29-31 March 1982 Abstract p. 45
Submitted to Mikroskopie (Austria)

Analysis of atmospheric aerosol samples gives detailed information on the deposition and transport of particulate matter important for clearing up environmental effects as well as for investigating physical processes in the Earth's atmosphere. Ecological and toxical effects are mainly governed by the concentrations of different components while atmospheric residence time and transport distance from the source to the point of deposfion depend on the size distribution of the aerosol particles.

PIXE analyses were performed on samples collected by pumping air of a given volume through NUCLEPORE filter or through a cascade impactor. The results reflect conditions in the meteorologic background station "K-PUSZTA" situated in Central-Hungary far from pollution sources. A comparison with similar data compliled from the literature shows that air pollution here reached only a moderate level. The evaluation of so-called enrichment factors helps us in separating antropogenic components present in the aerosol samples.

ELEMENTAL CONCENTRATIONS IN HUMAN ERYTHROCYTES AND BLOOD PLASMA FOLLOWING RADIOTHERAPIENTIC IRRADIATION

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Strahlentherapie 158. no. 12 (1982) p. 739-741

Elemental concentrations in whole blood samples from irradiated mice were found (1) to change uncorrelated with the depression of red blood cell count. The aim of the present work was to clear up whether or not similar effects appear in the case of human in radiotherapeutic irradiations. Concentration rations were taken for erythrocyte and plasma fraction with the proton induced X-ray emission method for the elements P, K, Ca, Fe, Zn in the case of patients undergoing postoperative gamma irradiation following mastectomy. None of the concentration ratios were found to be influenced under the present conditions of irradiation.

Reference

(1) Bearse, R. C., C. F. Burns, D. A. Close, I. I. Malanify, Nucl. Instr. Meth. 142 (1977) 143.

ANALYTICAL APPLICATION OF PARTICLE INDUCED X-RAY EMISSION (PIXE) IN ATOMKI

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*Institute for Atmospheric Physics, Budapest, Hungary

XXV. Hungarian Annual Conference on Spectral Analysis
7th Conference on Analitical Atomic Spectroscopy
Abstracts p. 265, Sopron 14-18. t. 1982.

Particle accelerators available in nuclear physics laboratories provide the opportunity to perform very sensitive elemental microanalytical measurements covering a broad range of atomic number is a single measurement. Particle induced X-ray emission method shows up outstanding features in a number of fields of interdisciplinary investigations.
The aim of the present talk is to survey the activities in PIXE field at the Van de Graaff accelerator laboratory of the above Institute.
Concentrations of some essential and practical elements were measured in human red blood cell and blood plasma samples from normal and pathological pregnancies. Conclusions were drawn on correlations between the changes in concentrations of different elements and physiological or pathological processes during pregnancy.
The effects of radiation load on homeopoietic organs during human radiotherapy were tested by the elemental analysis of blood samples taken during the period of the treatment. Changes in elemental concentrations observed in experiments performed on irradiated animals did not appear here.
Atmospheric aerosol samples were analyzed in order to get information on the presence of different elements of natural or anthropogenic origin in the atmosphere. The evaluation can result in data important from the point of views of environmental research and of atmospheric physics.

ANALYTICAL APPLICATION OF PARTICLE INDUCED X-RAY EMISSION

I. Kiss

Izotóptechnika (Budapest) 24 (1981) 168-174.
(In Hungarian)

A short survey about the principle and main features of PIXE method, essence of its implementation and applications in different fields.

ON THE EVALUATION OF SPECTRA OBTAINED IN PROTON INDUCED X-RAY EMISSION

L. Zolnai

ATOMKI Közlemények 24 (1982) 229-236. No. 4.

A mathematical method for analysis of spectra, with more complex structure, obtained in proton induced X-ray emission (PIXE) is described in this paper.

SEARCH FOR OPTIMUM PARAMETERS OF CPAA MEASUREMENTS

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Submitted to Proceeding of Meeting on Nuclear Analitical Methods, Dresden, 11-15 April, 1983

Charged Particle Activation analysis (CPAA) is a widely used method for identification and quantitative determination of trace elements. The sensitivity of determination for a given trace element depends on the irradiation and detection parameters as well as the matrix composition.
The aim of our work was to determine the optimal detection parameters in the case of high purity (99.999 % and 99.9999 %) Aluminium. The samples were irradiated with 8, 10, 12 and 18 MeV protons of 4 μA beam current on 1 cm^2 target spot. The gamma-spectra from the activated targets were measured by Ge(Li) spectrometer. The measurement began 5 min after the end of bombardment and the decay was followed for a week.

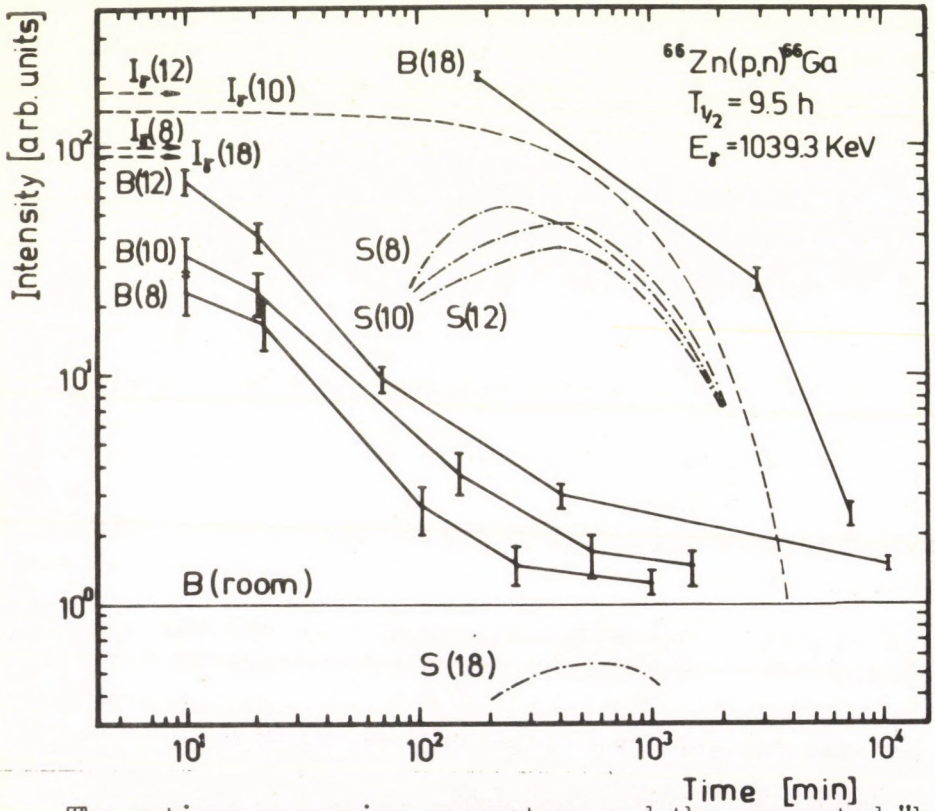

Fig.1. Experimental results for the determination of Zn in Aluminium matrix

The optimum measuring parameters and the connected "best sensitivity" was determine for every trace element in the matrix. As an example the results for Zn traee element activated in the reaction Zn-66(p,n)Ga-66 (9.5 h) will be discussed here. In Fig. 1. the intensities of E_γ=1039.3 keV photo-peak ($I_\gamma(E_p)$) coming from the decay of Ga-66 well as the intensities of the background at the photo-peak position ($B(E_p)$)and the ratios of these ($S(E_p)$) are shown as the function of time. The maximum of the $S(E_p)$ curves gives the optimum parameters which provide the "best sensitivity" for the Zn trace element in this matrix. For any special real case the $S(E_p)$ functions can be deduced for one or more elements from a preliminary experiment in order to determine the optimum irradiation and detection parameters.

ON ENDOGENOUS AND EXOGENOUS CALCIUM CONTENT OF HAIR SAMPLES USED IN XRF AND PIXE MEASUREMENTS

J. Bacsó, L. Sarkadi and E. Koltay

Int. J. Appl. Radiat. Isot. 33 (1982) 5-11

XRF and PIXE analyses of human head hair samples offer a diagnostical tool to follow a number of physiological and pathological processes. However, exogenous contaminations are to be eliminated in order to get data characteristic for the health conditions of the donor. Based on systematic investigations a washing method appropriate for eliminating exogenous calcium content is proposed and examples are given to show the effect of health conditions on calcium levels in hair samples.

THE POSSIBILITIES OF MICROANALYTICAL INVESTIGATIONS BY ELASTIC SCATTERING OF PARTICLE BEAMS

Gy-né Bornemisza, E. Koltay, E. Somorjai, I. Török and I. Uray

Meeting on The Role of Physics in the Environmental Protection, Szolnok, October 23 1978
ATOMKI Közlemények 24 (1982) Suppl.1. 40-47
(In Hungarian)

RELATIONSHIP BETWEEN THE HAIR'S CA-LEVEL AND THE ISCHAEMIC HEART DISEASE (X-RAY FLUORESCENT MEASUREMENTS)

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***Health Service of the Hungarian Roller Bearing Works, Debrecen

Annual Meeting of Committee of Hungarian Cardiologists Balatonfüred, 6-8, May 1982. Abstracts pp. 252-253.
(In Hungarian)

Magyar Belorvosi Archivum 35 (1982) 251-55
(In Hungarian)

ON THE POSSIBILITIES AND LIMITS OF XRF INVESTIGATIONS IN MEDICINE FOR DIAGNOSTICAL PURPOSES

J. Bacsó

15th Hungarian Annual Conference on Spectral Analysis 7th CANAS (Conference on Analitical Atomic Spectroscopy), Sopron, 14-18 June 1982
Abstracts of papers pp. 271.

THE POSSIBILITIES OF THE XRF METHOD IN THE DETERMINATION OF ORIGIN OF REGALIA IN INTERDISCIPLINARY COLLABORATION

J. Bacsó

Fizikai Szemle, 32 (1982) 199-201.
(In Hungarian)

PORTABLE ANALYSER WITH X-RAY TUBE EXCITATION FOR RAPID SORTING OF FERRO-ALLOYS

L. Andó and E. Vatai

Symposium on the Appl. of XRF Analysis in the Industry, Research and Environmental Protection Miskolc April 5-6, 1982. Abstracts p. 5.

INVESTIGATION OF SURFACE LAYERS OF STAINLESS STEEL SAMPLES USING XPS METHOD

I. Kádár, L. Kövér, I. Cserny, and J. Tóth

Submitted to Korróziós Figyelő
(In Hungarian)

XPS INVESTIGATION OF PASSIVE LAYERS

L. Kövér, J. Tóth, I. Kádár, and I. Cserny

Submitted to 4th Seminar on Electron Spectroscopy, Moscow, 11-16 May 1982

CHARACTERIZATION OF ALUMINIUM SEMIPRODUCT SURFACES BY ELECTRON AND IONBEAM METHODS (EXTENDED ABSTRACT)

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**Technical University, Budapest, Hungary

Material of the VII. International Leichtmetalltagung, June, 22-26, 1981, Leoben-Wien, pp. 218-219

STUDY OF THE POSSIBILITY OF NITROGEN MAPPING BY CR-39 TRACK DETECTORS

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XIII. Int. Symp. on Autoradiography, Tábor (CSSR) 2-5, May, 1983.

STUDY OF BORON TRANSPORT IN PLANTS WITH A MICRORADIOGRAPHIC METHOD

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**Josef Stefan Institute, Ljubljana, Yugoslavia

Isotopenpraxis 18 H.12. (1982) 418-423

The process of passive transport of borate and tetraborate ions was studied in the root of carrot and in the tuber of potato with a quantitative microradiographic method. The boron concentration profiles developing within the plants were determined after various diffusion times, by utilization of the $^{10}B(n,\gamma)^{7}Li$ nuclear reaction. A polycarbonate nuclear track detector registered the ^{7}Li nuclei and the alpha-particles. The differential equation of linear diffusion combined with convection was used to describe the concentration profiles within the plants. The diffusion coefficients were determined by means of a computer programme.

SOME NEW NUCLEAR METHODS AND THEIR APPLICATION IN AGRICULTURAL RESEARCH AND PRACTICE

D. Berényi

Proceedings of the ESNA European Society of Nuclear Methods in Agriculture, Debrecen, 25-29 August, 1980. Debrecen, 1982. pp. 17-33.

EXPERIMENTAL CONDITIONS INFLUENCING THE DETERMINATION OF BORON BY CARMINIC ACID

Z. Sámsoni, and A. Szeleczky

Agrokémia és Talajtan Tom. 30. (1981) No. 3-4.
(In Hungarian)

Detailed experiments were carried out to find the factors which influence the sensitivity and accuracy of boron determination by carminic acid.

It has been found that the water and hydrochloric acid content of the sample solution can be characterized by an optimum curve concerning the developing colour intensity. The optimum water content is about 5 %, and the optimum hydrochloric acid content is 1-3 % (38 % HCl).

The colour intensity of the complex is considerably influenced by the interval between the preparation of the sample solution and the determination. A two-hour-interval is necessary to get duly sensitive and suitably accurate results. The application of sulphuric acids from different sources can influence considerably the colour intensity of the boron-carminic acid complex by their different water contents. Warming during the interval is definitely harmful, because the sensitivity is considerably decreased by it. The most convenient concentration of carminic acid for the analytical purpose (0.025 %) and the optimum wave-lenght for the measurement (628 nm) were determined. Finally, we demonstrated the absorption spectrum of boron-carminic acid complex between 330-800 nm.

ANALYTICAL INVESTIGATION OF THE MACRO- AND MICRONUTRIENT CONTENTS OF THE HEATH PLANTS IN THE BORSODI MEZŐSÉG REGION OF HUNGARY

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Agrokémia és Talajtan Tom. 30. (1981) No. 3-4.
(In Hungarian)

EARTH SCIENCES AND ENVIRONMENTAL RESEARCH

FISSION PRODUCTS AND RADIOCARBON AS ENVIRONMETNAL POLLUTANTS DUE TO ATMOSPHERIC NUCLEAR WEAPON TESTS MEASURED IN DEBRECEN SINCE 1952

E. Csongor, and E. Hertelendi

ATOMKI Közlemények 24 (1982) 179-183, No. 3.

Atmospheric nuclear weapon tests produce large amounts of radioactive fission products and a large neutron flux. From the year 1952 regular measurements have been made on the total beta activity of the daily precipitation. The annual sums of beta activity measured from 1952 to 1979 are presented. Excess ^{14}C was produced by the large neutron flux of the atmospheric nuclear weapon tests. The variation of the atmospheric ^{14}C concentration from 1950 to 1978 was measured by the analysis of tree rings. The excess ^{14}C activity was determined from the alphacellulose fraction of the tree rings by proportional counting.

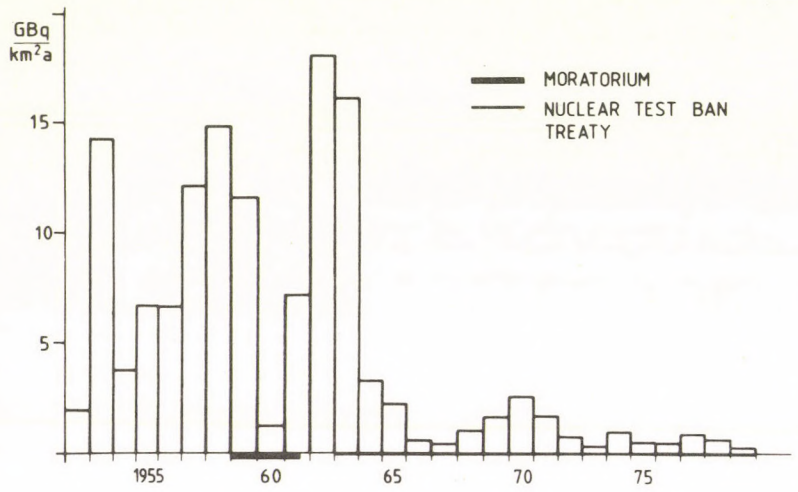


Fig. 1. Annual sums of beta activity of fission products in the atmospheric precipitation in Debrecen

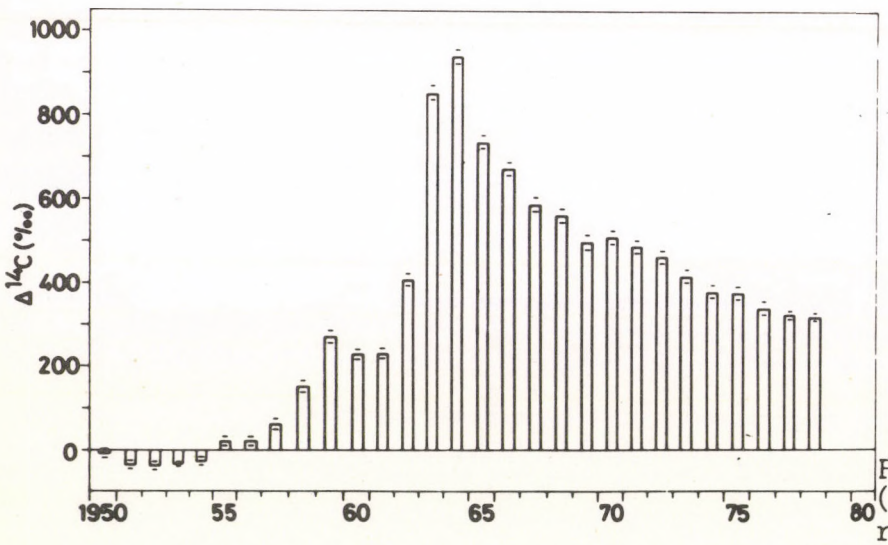


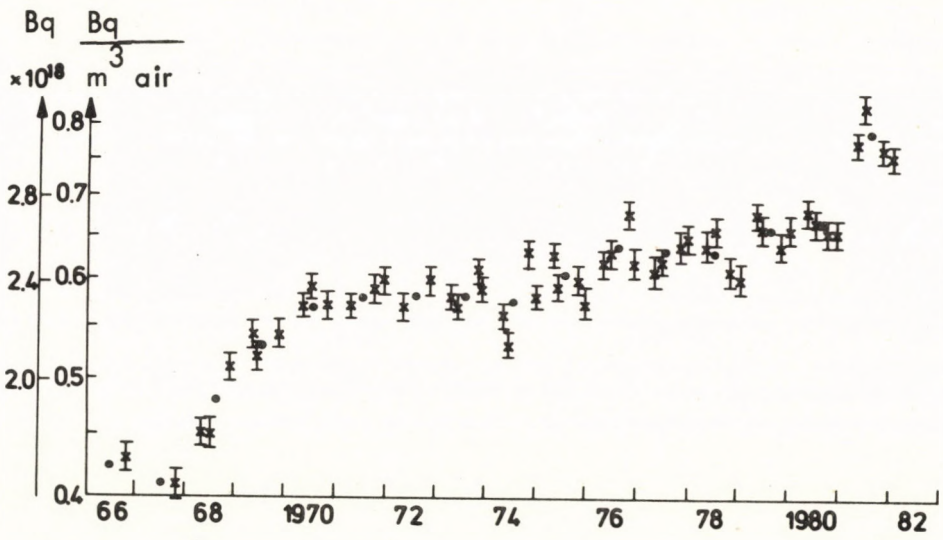
Fig. 2. Excess ^{14}C ($\Delta^{14}C$) measured in tree rings in Debrecen

METHOD FOR THE MEASUREMENT OF THE CONCENTRATION OF ATMOSPHERIC ^{85}KR AND THE RESULTS OF THE MEASUREMENTS CARRIED OUT IN HUNGARY

E. Csongor

2nd International COMECON Conference on Radiological Protection Problems Associated with the Operation of Nuclear Power Plants, Vilnius 18-23 May 1982

Measurement of the concentration of atmospheric ^{85}Kr has been continued by the same measuring technique as used continuously since 1966. The Kr gas samples are produced by the Krypton-Factory (Miskolc, Hungary) and measured with internal GM counters in Debrecen, The measured data from the year 1977 to 1981 are presented. The atmospheric ^{85}Kr concentration was nearly stabilized in the last decade but it is increasing significantly in the year 1981. The average concentration of the year 1981 is 0.79 Bq/m^3 air. The accumulated ^{85}Kr content in the atmosphere is more than 3.0x10^{18}Bq.



Concentration of atmospheric ^{85}Kr measured in Debrecen between 1966-1981.

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1) E.Csongor, Acta Phys. Hung. 28 (1970) 109
2) E. Csongor, Proc. Int. Conf. on Low Radiactivity Measurements and Applications, 6-10 Oct. 1975, The High Tatras Czechoslovakia, Ed. P. Povinec and S. Usacev, (SPN Bratislava 1977) p. 471
3) E. Csongor, ATOMKI Közl. 21 (1979) 1

THE PERIODS OF SAND MOVEMENT IN THE PART OF THE GREAT HUNGARIAN PLAIN

Z. Borsy*, É. Csongor, I. Szabó

*Geographical Institute, Kossuth University, Debrecen, Hungary

XI.th Congress of Int. Union for Quaternary Research, Moscow, Aug. 1982. Abstracts Vol.II. p. 29.

In Hungary in the NE part of the Great Hungarian Plain the wind-blown sand takes up large territories. The sand of the dunes was blown out from the material of Pleistocene alluvial fans by the northerly winds.
Earlier - in the lack of C-14 data - it could be concluded to the age of the dunes only from stratigraphic, palynological and pedological investigations. In the last time at different places charcoal was found in the fossil soile occuring inside of the dunes. On the basis of their radiocarbon dating the followings may be said about the origin of the sand dunes.
In the NE part of the Great Hungarian Plan the most significant sand movement took place during the first cold maximum of the Upperpleniglacial period between 26,000-20,000 years. About 20,000 years ago loessy cover started to come into being at several places on the already developed dunes. However on the surfaces full of dunes, rising to the highest level, the wind-blown sand might have moved quite till the Late Glacial period.
In the Bölling interstadial a thin stepp-like soil developed on the motionless dunes. On the dune surfaces rising to the highest, the process of the soil formation was broken at several places by the sand movement taking place in the II. stadial of the Dryas. In the Alleröd period a stepp-like soil formation began on the blown-sand surfaces. In the younger Dryas period the vegetation became rather scanty on the higher situated dune surfaces during the time of the cold dry climate. The scanty vegetation could not provide the surface enough shelter from the attacks of the northern winds, and so the movement of the wind-blown sand started again. The blown sand came into motion at several places, deposited on the forms developed in the Upperpleniglacial period, and burried them. The sand migration in the II. stadial of the Dryas and younger Dryas fell behind the large sand movement of the Upperpleninglacial period as regards its size. From the Preboreal period till the 18th century there wasn't any significant sand movement on the wind-blown sand surfaces being sheltered by vegetation.

MOBILE SAND PHASES IN THE NORTH-EAST PART OF THE GREAT HUNGARIAN PLAIN

Z. Borsy*, É. Csongor, I. Szabó

*Geographical Institute, Kossuth University, Debrecen, Hungary

Quaternary Studies in Hungary
Ed. INQUA (International Quaternary Association)
Hungarian National Committee, Budapest, 1982.
pp. 193-208.

THE VARIATION OF THE TROPOSPHERIC ^{14}C CONCENTRATION FROM 1977 TO 1980 IN HUNGARY

É. Csongor, E. Hertelendi

Izotóptechnika, (Budapest) 24 (1981) 188-196 No.4.
(In Hungarian)

A review on how the troposheric ^{14}C concentration varied in the last decades due to anthropogenic sources (industrialization, atmospheric nuclear weapons tests, nuclear industry). Measurements were carried out by the analysis of tree rings and leaves of the years from 1977 to 1980 to determine the ^{14}C concentration. The α-cellulose component of trees cut around Debrecen and Paks were used and the excess ^{14}C activity was measured by proportional counter.

EXAMINATION OF THE BED OF THE KARCSA BROOK WITH POLLEN ANALYTICAL AND RADIOCARBON METHODS

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*Geographical Institute, Kossuth University, Debrecen, Hungary

PERIODS OF BLOWN SAND MIGRATION IN THE NE PART OF THE GREAT HUNGARIAN PLAIN

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**Department of Botany, Roland Eötvös University, Budapest, Hungary

Acta Geographica Debrecina 1982. Sept.

GAS CARRIER AND DEGASSED MAGMATIC ROCKS AND THE PRIMORDIAL ATMOSPHERE

A. Szalay

Submitted to Acta Physica Academiae Scientiarum Hungaricae

ON THE POSSIBILITY OF MASS SPECTROSCOPIC TRICIUM DETERMINATION IN NATURAL WATERS

K. Balogh, E. Hertelendi

Hidrológiai Közlöny, No. 12. (1981) 553-559.

K/AR DATING OF ALUNITIC MINERALIZATION IN SOVIET TRANSCARPATHIA

Z. Rakovits*, K. Balogh, G. G. Szaszin**

*Hungarian State Geological Institute, Budapest, Hungary
**Transcarpathian Geological Expedition, Beregovo

Földtani Közlöny 111 (1981) 205-220

AGE AND DURATION OF THE INTERMEDIATE AND BASIC VOLCANISM IN THE TOKAJ MOUNTAINS, HUNGARY, IN THE LIGHT OF K/AR DATA

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*Department of Mineralogy, Kossuth University, Debrecen, Hungary
**Hermann Ottó Museum, Miskolc, Hungary

Földtani Közlöny 111 No. 3-4 (1981) 413-423

RADIOMETRIC DATA FROM THE EOCENE/OLIGOCENE BOUNDARY STRATOTYPE IN HUNGARY

K. Balogh

Worksop on Terminal Eocene Events, Visegrad, March 27 - April 1, 1983

CYTOGENETICAL INDICATOR OF RADIATION EFFECT, III. CHROMOSOMAL ABERRATIONS INDUCED BY 14.9 MEV NEUTRONS

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Izotóptechnika, 25 (1982) 242-247. No. 3.

Chromosome aberrations of human peripheral blood lymphocytes were analyzed after in vitro irradiation with 14.9±0.3 MeV neturons at a dose rate of 0.013 Gy/min. In the dose range of 0-1.06 Gy a linear dose-effect relationship was established between doses and frequencies of chromosome aberrations. Dose-response curves of 250 kV X-ray and ^{60}Co γ-rays were related to data of neutron irradiation under the same experimental conditions for the determination of RBE of 14.9 MeV neutrons. A comparison with dicentric plus ring aberrations in the same range gave 2.3, while with the total number of aberrations gave an RBE of 2.7.

RB-SR ISOTOPIC STUDIES ON GRANODIORITIC ROCKS FROM THE MECSEK MOUNTAINS, HUNGARY

É. Svingor, Á. Kovách

Acta Geologica Academiae Scientiarum Hungaricae,
Vol. 24 (2-4), pp. 295-307 (1981)

New isotopic age determinations carried out with the rubidium-strontium method on granodioritic basement rocks from the Mecsek Mountains in Southeastern Transdanubia give further support to assumptions on a polyphase development of the Mecsek crystalline. As shown by initial Sr isotopic ratios, the protolith of the granodioritic assemblage of polymetamorphic-anatectic origin must have been strongly basic in its composition. Granitization processes commenced about 430 million years age, thus the (sedimentary) protolith assemblage subjected to granitization must have been at least Lower Siluarian in its age. The scatter of individual model ages obtained on total rock samples reflects the polymetamorphic-polytectonized character of the basement, and suggests that following a primary granitization process sedoncary events might have led to the total or partial recrystallization of the rocks in question. An event at about 335 million years (Early Carboniferous) seems to be of special importance, and is characterized by potash metasomatism having affected more or less the entire basement mass. This interpretation of this event as the onset of regional emergence is supported by the fact that biotite ages indicate a lowering of ambient temperature below the blocking temperature of the biotite Rb-Sr isotopic system.
The tectonic development of the basement crystalline as reflected in the isotopic age data closed at about 270±20 million years with processes causing retrograde changes in the crystalline as a whole, but leading to the development of dyke rocks in the tectonically active parts of the basement mass.

AGES OF SOME INTRUSIVE ROCKS OF SOUTHWESTERN MAINE, U.S.A.

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**Department of Geology, Bowdoin College, Brunswick, ME 04011, U.S.A.

Canadian Journal of Earth Sciences 19 (1982) 1350

Whole-rock Rb-Sr and U-Pb zircon age measurements on instrusive rocks in southwestern Maine indicate igneous activity at 400, 340 and 320 Ma. These plutonic rocks were emplaced into deformed Ordovician to Devonian (?) and perhaps Hadrynian rocks of the Skapleigh and Merrimack Groups. Folding of the Shapleigh and Merrimack Group rocks is interpreted to have occurred during the Acadian event, or before. The 403±$^{2}_{4}$Ma age of the Webhannet pluton in southwestern Maine sets a minimum time for Acadian deformation in this region.
The 320 Ma age of the Lyman two-mica granite pluton of this study coupled with the reported ages of the Milford two-mical granite (275 Ma) and Lake Sunapee two-mica granite 323 Ma of New Hampshire suggests a spectrum of Hercynian igneous activity in northern New England similar to that of the well established Hercynian intrusive events in the southern Appalachians and western Europe.

RB-SR ISOTOPIC AGES OF GRANITOID ROCKS IN THE SPIS-GEMER METALLIFEROUS MOUNTAINS, EASTERN-SLOVAKIA

É. Svingor, P. Grecula*, and Á. Kovach

*Geologicky Pricskum, Kosice, Czechoslovakia

Submitted to Mineralia Slovace

ENVIRONMENTAL RADIATION MEASUREMENTS

G. Somogyi

Lecture given at Physics Department,
University Clermont-Ferrand May 25, 1982

SUBSURFACE RADON-DISTRIBUTION MEASUREMENTS WITH LR-115, CR-39 AND Tl-DETECTORS

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*Secondary School Hajnóczy, Tiszföldvár, Hungary
**Central Research Institute for Physics, 1525 Budapest, Hungary
***Mecsek Ore Enterprices, Pécs, Hungary

Solid State Nuclear Track Detectors,
Proceedings of the 11th International
Conference Bristol, 7-12 September 1981.
Nuclear Track: Methods, Instruments and Applications
Supplement No. 3. Oxford, 1982. Pergamon Press, pp.525-529.

By using LR-115, CR-39 and termoluminescens detectors, long-term alpha- and gamma-activity measurements have been carried out to study the shape of radon distribution under different environmental conditions. The Rn profiles have been measured in vertical direction in soils, wells and underground caverns. A four-year seasonal variation of the mean Rn content in soil gas at shallow depth and a variation of the Rn concentration in the air of a Hungarian cave system during a three-year period is presented. It is found that the seasonal variation of the mean gamma dose rate measured by $CaSO_4$:Dy TL-detectors in cave air and the seasonal Rn-pattern measured by nuclear track detectors in cave soil gas display a definite correlation. It is proved that the difference between the outdoor and indoor temperatures plays a predominant role in the formation of seasonal variations of Rn concentration. A new method is developed to measure the degree of equilibrium between Rn and its daughter products.

ANNUAL VARIATION OF α-RADIOACTIVITY IN SEVERAL HUNGARIAN CAVES

Gy. Somogyi, Zs. Varga, G. Izápy*

*Kastic-Water Research Station, Jósvafő, Hungary

Symposium on Kasthidrology, Jósvafő, Nov, 13, 1982
(In Hungarian)

STUDY OF ALPHA-ACTIVITY DISTRIBUTIONS IN ENVIRONMENTAL SAMPLES BY CR-39 TRACK DETECTORS

I. Hunyadi, G. Somogyi, S. Szilágyi

Submitted to XIII. Int. Symp. on Autoradiography, 1983.
May 2-5, Tábor (Czechoslovakia)

DEVELOPMENT OF METHODS AND INSTRUMENTS

STATUS REPORT ON CYCLOTRON LABORATORY PROJECT

A. Valek and G. Bibok

Recognising the importance of cyclotrons, our institute has been urging for a decade to establish a cyclotron laboratory. To prepare the project of the laboratory a symposium on the interdisciplinary use of cyclotrons was held in Debrecen in 1975 [1] and the concrete realisation of the project began in 1978.

The engineering of the building, the beam transport system, the equipments of radiochemical laboratory, etc. were finished by June 1982 and the construction work of the building for the cyclotron started in October 1982. The total ground place of the building is about 5600 m^2, the approved cost of the investment, covered mainly by the Hungarian Academy of Sciences, is about 250 MFt. The project is partly supported by the International Atomic Energy Agency in Vienna, the Hungarian Atomic Energy Comission and the National Committee for Technical Development.

The laboratory will be equipped by a small sized, MGC type compact isochronous cyclotron. The cyclotron and the beam transport system are manufactured by the D. Efremov Scientific Research Institute of Electrophysical Apparatus in Leningrad. The cyclotron is designed to accelerate protons, deuterons, helium-3 and helium-4 particles. The pole diameter of the electromagnet is 103 cm. The resonance conditions for different particles at various energies are presented on the figure. For scientific and interdisciplinary researches and industrial and medical applications of the cyclotron programmes were carried out. The realisation of these programmes also started by designing of experimental instruments.

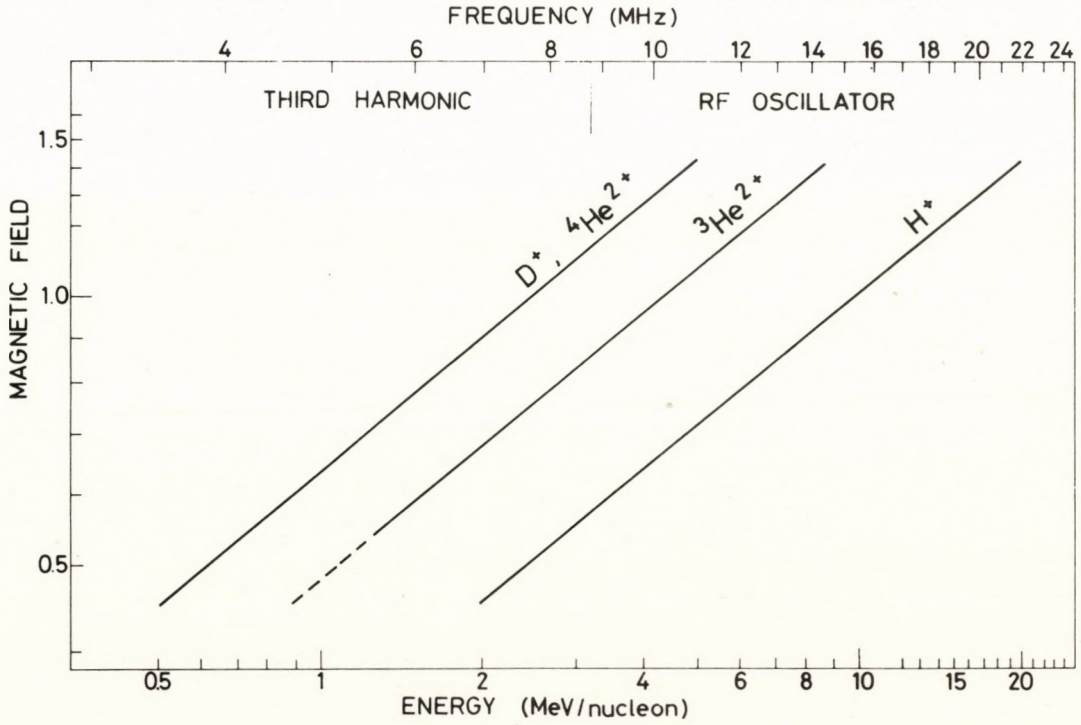


Fig. 1. Resonance condition for various particles.

Reference:

[1] ATOMKI Közlemények 17 (1975) Supplement

CYCLOTRON LABORATORY PROJECT OF ATOMKI

Gy. Bibok, A. Valek

Symposium on Fast Neutron Cancer Therapy October 12, 1981.
Debrecen, Hungary
ATOMKI Közlemények 24 (1982) 59 No. 1.

The article describes the cyclotron laboratory to be established in ATOMKI. The main parameters of the accelerator and beam transport system, the time schedule of the investment and a short survey of the planned activities are given.

COMPARISON OF DIFFERENT METHODS OF SHIELDING CALCULATION

I. Uray

ATOMKI Közlemények 24 (1982) 147-155 No. 2.

A comparative study has been prepared for different shielding calculation methods. The wall and roof thickness data of the Debrecen cyclotron laboratory were calculated by using simple and high level computing programs. The results of different calculations agree very well.

POSSIBILITIES FOR THE MEDICAL USE OF THE MGC CYCLOTRON

I. Mahunka, I. Uray

Symposium on Fast Neutron Cancer Therapy
ATOMKI Közlemények 24 (1982) 63-65

Cyclotrons, which are very effective basic equipments for fundamental research in nuclear physics, nowadays are more and more extensively used in the different fields of other sciences and in practice, too. Our future cyclotron laboratory, based on a small compact cyclotron, will be used also for medical, agricultural and industrial purposes.
In this paper a short review will be given about the possibilities of appliations using MGC cyclotron.

POSSIBLE MEDICAL-BIOLOGICAL USE OF THE FIRST HUNGARIAN CYCLOTRON

I. Uray

Orvosi Hetilap, 123 (1982) 3021-3023
(In Hungarian)

The cyclotron being installed in Debrecen will be the first one and the largest acclerator in the country. This basic equipment is very important also from the medical point of view, because it is applicable in different fields of medical research and treatment. The article gives a review about the possibilities of cyclotron applications first of all for doctors.

THE CYCLOTRON PROJECT AT ATOMKI

I. Mahunka

Abo Akademi, Dept. of Phys. Turkun, Finland,
22. June 1982

APPLICATION OF CYCLOTRON IN AGRICULTURAL RESEARCH

Bornemisza-Pauspertl P.

Submitted to Fizikai Szemle
(In Hungarian)

OPERATION AND DEVELOPMENT OF THE 5 MILLION VOLT VAN DE GRAAFF ACCELERATOR

Á. Z. Kiss, E. Koltay, I. Papp, Gy. Szabó

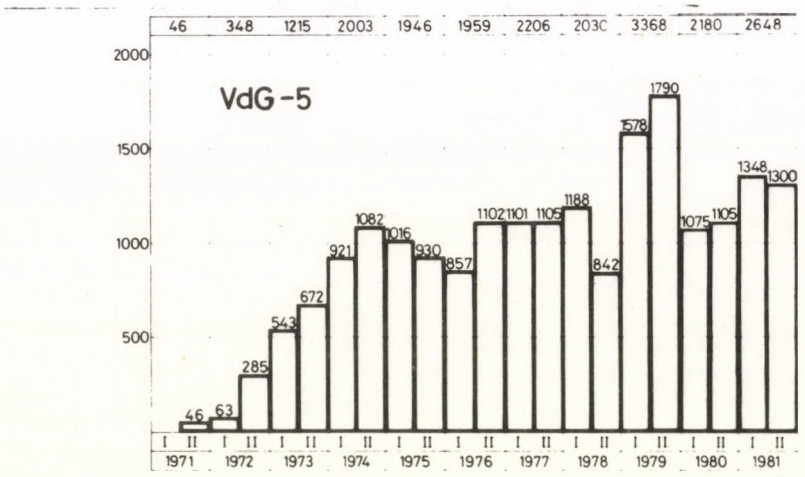
In 1982 the Van de Graaff accelerator has begun the second decade of its work.
During its first lo years of operation VDG-5 produces 19 900 hours of beam. During this time the performance of the machine in terms of output current, selection of ion species and overall reliability were continueously improved and the accelerator became one of the principal facilities of the institute. The annual working times were always limited by the number and actual needs of the users. The running time distribution for 1972-1981 is presented in Fig. 1. in a half years graduation.
In 1982 development works were mainly limited to systematic bremsstrahlung measurements aiming at the test of the electron-optical characteristics of the spiraling field acceleration tube. No changes were made to the accelerator, only regular maintenance was carried out.
In 1982 the accelerator supported a very broad program of experimental work in a total machine time of 1956 hours. (see table 1). The use for interdisciplinary studies based on elemental analysis is increasing rapidly. The distribution of operating time versus ion species is shown in table 2. The highest attainable terminal voltage was 4.2 MV during experiments, mainly limited by the ageing of the present acceleration tube.

Table 1.

Field	hours	%
Nuclear physics	684	35.0
Atomic physics	308	15.7
Analytical studies	774	39.6
Other experiments	93	4.7
Machine tests	97	5.0
total	1956	100

Table 2.

Species	hours	%
H^+	1416	76
$^4He^+$	379	20.5
C^+,N^+,O^+	64	3.5



AVOIDANCE OF BLISTER FORMATION IN TARGET BACKINGS DURING α-PARTICLE BOMBARDMENT

Á. Z. Kiss, B. Nyakó, E. Somorjai, A. Anttila*, and M. Bister*

*Department of Physics, University of Helsinki,
SF-00170 Helsinki 17, Finland

Nuclear Instruments and Methods 203 (1982) 107.

High beam currents (even up to 100 μA) normally used in (α,γ) measurements put high demands on the durability of the target. On the other side, already a limited number of α-particles causes blisters, flakes, or bubbles in all backing materials and thus destroys the target.
A possible way to eliminate blisters was found by us in roughening the surface of the backings so that the excess of the He bombarded into it could leak out. First the roughening was performed by the sandblow method. This procedure was suitable for eliminating blister formation, but the grains contaminated the surface. Finally a less sofisticated method was applied to achive roughening in the case of tantalum: the surface was scratched manually under a microscope with a needle made of hard tool steel. The sheets handled in this way withstood very long runs without blistering, up to at least 50 C/cm^2.
Targets implanted into the scratched Ta backings are in general suitable for normal spectroscopic purposes. In DSA experiments however, comparative measurements had to perform to investigate whether the lifetimes are affected by the possibly altered stopping conditions in the roughened layer. The well known lifetime of the 2780 keV level in ^{19}F from the $^{15}N(\alpha,\gamma)^{19}F$ [1] was selected for this purpose. As a result, a rather small correction factor was obtained for the density of the backing.
Using target prepared by our roughening method, the lifetime of the 4550 keV state in ^{19}F was determined for the first time in the (α,γ) reaction. An $F(\tau)$ value of 97.9±1.6 % was deduced which yields a lifetime of 6.5±3.5 fs including a 0.9 fs increase as a correction due to the effect of roughening. It was the high stopping power of tantalum which permitted us to measure this short lifetime.

Reference

[1] A. Anttila, S. Brandenburg, J. Keinonen and M. Bister, Nucl. Phys. A334 (1980) 205.

OPTICAL BEHAVIOUR OF ACCELERATION TUBES STUDIED IN BREMSSTRAHLUNG MEASUREMENTS

Á. Z. Kiss, E. Koltay, Gy. Szabó, and J. Félszerfalvy*

***Institute for Applied Physics, Kossuth University, Debrecen, Hungary**

Submitted to Nuclear Instruments and Methods

Ion-optical behaviour of acceleration tubes of different field structures has been studied by comparing the results of trajectory calculations with experimental data obtained in bremsstrahlung measurements. Intensities and end point energies of X-radiation were measured by a NaI(Tl) counter, while intensities and average energies were taken by thermoluminescent dosimeters (TLD). Dose rate distribution taken by TLD-s in the immediate vicinity of the tube was compared with those generated from data measured at the outer wall of the generator vessel. Similar procedure was followed for tubes of homogeneous field as well as of inclined fields with alternating or spiralling transversal components. The tubes were used through long operating times in a 5 MV Van de Graaff accelerator.

ION MICROBEAMS IN MICROANALYTICS

E. Koltay

XII. Conference on Electron Microscopy and Microanalysis
Eger 29-31 March 1982
Abstracts p. 41
Submitted to Mikroskopic (Austria)

The lecture gives a survey on the development in the field of the micro-analytical method based on ion microbeam systems. Questions of construction and applications is treated and the different characteristics of electron and ion microbeam systems are treated in details. The possibilities of the construction of an ion microbeam channel at the 5 MV Van de Graaff accelerator in ATOMKI (Debrecen) is treated.

HIGH RESOLUTION SI(LI) X-RAY SPECTROMETER WITH HIGH THROUGHPUT RATE

J. Bacsó, G. Kalinka, Zs. Kertész, P. Kovács, and T. Lakatos

ATOMKI Közlemények 24 (1982) No. 2. pp. 133-146.

This paper presents the description of a modern Si(Li) X-ray spectrometer developed in ATOMKI. The Si(Li) detectors are single-grooved with active area of 20-50 mm^2. The Be window is coated with a special protective layer against corrosion. A small getter-ion pump maintains the high vacuum in the cryostat chamber. The preamplifier employs pulsed drain feedback, in the first stage seleted, teflon encapsulated field effect transistors are used. The analogue signal processor is direct coupled and employs time variant pulse shaping. This construction provides high resolution (150-170 eV), high throughput rate, excellent stability, effective pile-up elimination, accurate live-time correction and simplicity in the applications. The live-time correction is performed by a random pulse generator, its average frequency is stabilized and the corresponding peak appears at zero energy in the spectra.

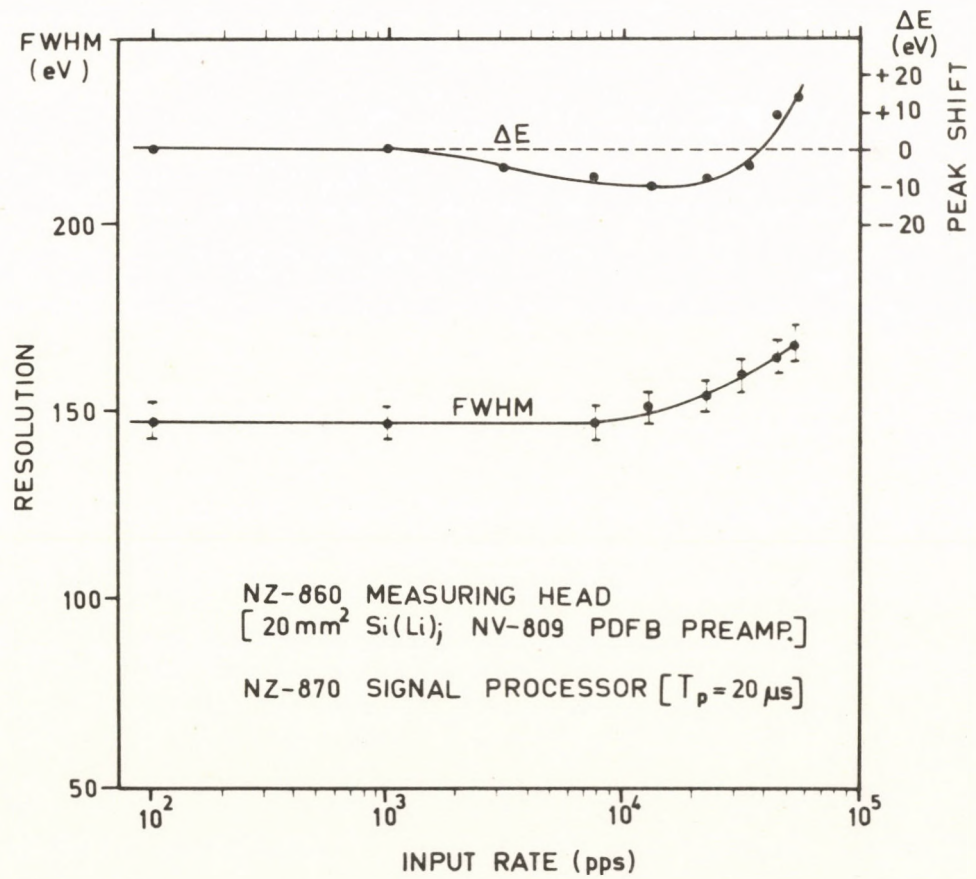


Fig. 1. Energy resolution and peak shift as a function of input count rate for the 5.9 keV line of ^{55}Fe.

INVESTIGATION OF NOISE-PARAMETERS AND IMPROVEMENT OF ENERGY RESOLUTION OF SI(LI) X-RAY SPECTROMETER

G. Kalinka

PhD Dissertation, Kossuth University, Debrecen, 1980
(In Hungarian)

THE NEW ENERGY DISPERSIVE X-RAY SPECTROMETER OF ATOMKI

J. Bacsó, G. Kalinka, P. Kovács, and T. Lakatos

Meeting on Application of X-ray Fluorescence Analysis in Industry, Research and Environmental Protection, Miskolc 5-6 April, 1982
ATOMKI Közlemények 24 (1982) Suppl. 3. pp. 13-16.

DATA ACQUISITION AND PROCESSING SYSTEM OF ENERGY DISPERSIVE X-RAY SPECTROMETER WITH MICROPROCESSOR

G. Horkay, M. Kis-Varga, T. Lakatos, J. Molnár

15th Hungarian Annual Conference on Spectral Analysis and 7th CANAS (Conference on Analitical Atomic Spectroscopy)
Abstracts of Papers p. 263.

Meeting on Application of X-ray Fluorescence Analysis in Industry, Research and Environmental Protection, Miskolc 5-6 April, 1982
ATOMKI Közlemények 24 (1982) Suppl. 3. pp. 16-19.

FAMILY OF NUCLEAR SPECTROSCOPIC MEASURING INSTRUMENTS

Gy. Máthé

Nowosty Interatominstrument (1981) 8-10 No. 4.
(In Russian)

A NEW SOLUTION FOR COINCIDENCE-ANTICOINCIDENCE CIRCUIT IN CAMAC MODUL

Gy. Bibok, J. Gál

ATOMKI Közlemények 4 (1982) 245 No. 4.
(In Hungarian)

The article presents a coincidence-anticoincidence unit, fitting into a CAMAC crate, which can be used in the 1 μs time range.
Using a new method the resolving time can be set for several channel by only one control continuously in both coincidence or anticoincidence modes.

DEAD TIME AND PILE-UP CORRECTION METHODS IN THE QUANTITATIVE PULSE HEIGHT SPECTROMETRY

J. Gál, Gy. Bibok

ATOMKI Közlemények 24 (1982) 95. No. 2.
(In Hungarian)

Correction for dead time and pile-up losses in quantitative pulse amplitude spectrometry is of great importance, especially in the case of high counting rate. The article surveys instrumental methods that are frequently used for dead time and pile-up corrections nowadays. The problems of varying counting rate are discussed, and the different correction techniques which can be used in these cases are critically examined.

SIMPLE DEAD-TIME AND PILE-UP CORRECTION TECHNIQUE USING A GATED PERIODIC TRAIN

J. Gál, Gy. Bibok

Submitted to Nucl. Instrum. and Meth.

In a pulse-height analysis system using a gated periodic pulse train for the correction of counting losses, it is shown that both the dead-time and pile-up losses can be corrected for if the clock pulses have the same width as the so called true pile-up time of the pulse processing system, and the clock pulses are rejected from the pulse train if a coincidence between the shaped clock pulses and the busy time of the system is detected. The technique was tested both with random-pulse generators and a Ge(Li) detector (^{60}Co and ^{137}Cs sources). At counting rate up to 50 kc/s, it is shown that the correction was accurate to ±1 %.

AMPLIFIER AND SIGNAL PROCESSOR SYSTEMS WITH TIME VARIANT PARAMETERS FOR SEMICONDUCTOR RADIATION-DETECTORS

T. Lakatos

Dissertation for CPC, 1982, Debrecen
(In Hungarian)

NEW PRINCIPLES AND METHODS FOR IMPROVING THE PARAMETERS OF NUCLEAR MEASURING INSTRUMENTS

J. Gál

Dissertation for CPC, 1982, Debrecen
(In Hungarian)

INTERFACING AN NTA 31024 MULTICHANNEL ANALYSER TO A TPA-I SMALL COMPUTER

J. Pálvölgyi

ATOMKI Közlemények 3 (1982) 185-190 No. 3.
(In Hungarian)

An interface, which uses programmed data transfer for controlling the main functions of an NTA 31024 type analyser and for reading out its memory content is described.

INTERFACING OF THE EMG-666 TYPE DESKTOP CALCULATOR TO THE TPA-I SMALL COMPUTER

J. Pálvölgyi

ATOMKI Közlemények 4 (1982) 253-257. No. 4.

An interface is described, which connects the I/O channel of an EMG-666 calculator to the programmed data transfer bus of a TPA-i computer. One part of the interface is an EMG 97845 universal interface. The data transfer is controlled by the EMG-666 calculator.

LOCAL NETWORK COMPOSED OF MICROS AND A MINI (PDP-11) HARDWARE

S. Lőkös

Joint Austrian-Hungarian DECUS Symposium, Sopron, May 5-7, 1982.

A SOPHISTICATED DU-11 DRIVER IN RSX FOR EMULATING UT200

G. Székely and Gy. Asztalos

Proceedings of the Digital Equipment Computer Users Society, Geneva, 1982
DECUS EUROPE Vol. 8. p. 131-134.

The system is able to transfer messages and files between a PDP-11 and a CDC machines through a DU-11 synchronous line interface. The main part is the driver which performs almost all the tasks of an UT200 controller.

A SIMPLE ACCOUNTING SYSTEM IN RSX-11M WITH CONSTANT OVERHEAD

G. Székely and Gy. Asztalos

Proceedings of the Digital Equipment Computer Users Society Geneva, 1982
DECUS Europe Vol. 8. p. 347-351.

The system notes the login and logout information together with the sizes of the use of the Central Processor Unit and the memory into a log file. The methods of the measurement of the above data are described and the implementation and experience are discussed.

CON - A PROGRAM TO MAKE A FILE CONTINUOUS ON A FILES-11 DISK

G. Székely

Submitted to DECUS Euroscope

DCO- DISK COMPRESS AND OPTIMIZE UTILITY IN RSX

G. Székely

Joint Austrian-Hungarian DECUS Symposium Abstracts, KFKI kiadvány 82-201, Budapest, 1982.

THE ROLE OF COMPUTATIONAL TECHNIQUES IN THE WORK OF THE ATOMKI

G. Székely, T. Vertse

Számitástechnika 13 (1982) 4. No. 11.

A CROSS ASSEMBLER PROGRAM FOR SIGNETICS' 8x300 MICROPROCESSOR

K. Juhász

Joint Austrian-Hungarian DECUS Symposium, Sopron, May 5-7 1982

PADÉ-TYPE APPROXIMATIONS

Gy. Posán

Diploma Work, JATE, Szeged, 1982

QUADRUPOLE MASS SPECTROMETER COUPLED TO DERIVATOGRAPH

I. Berecz, S. Bohátka, G. Langer and G. Szöőr*

*L. Kossuth University Institute of Mineralogy and Geology, H-4010 Debrecen, Hungary

9th Int. Mass Spect. Conf. Vienna, Austria, 30 Aug - 3 Sept, 1982.

This combination was built for broadening the capabilities of a thermoanalytical instrument, type: Q-Derivatograph (1). The samples placed in ceramic crucible are heated up to max. 1500 ^{o}C and the mass and temerature variations are measured very precisely in the derivatograph. Gaseous products are analysed by a quadrupole mass spectrometer (2). The coupling unit is a two-step pressure reduction system. Sample gas is pumped through a 1 m capillary and a small portion of it is allowed to get into the ioniser via the molecular filter of the sample valve. The capillary and the sample valve is bakeable up to 200 ^{o}C to reduce losses of condensable products and the blocking of the capillary. The overall response time of this system is 50 ms and it is fast enough to follow the quick changes in the derivatograph. The quadrupole is pumped with an oil diffusion pump system of 1.10^{-8} mbar ultimate pressure without baking. The vacuum system and the sample valve are operated and protected by an electronic control unit. The first measurements with the coupled system were carried out on carbonats, sulphates, sulphides and simple salts (compounds and minerals alike) to show the capabilities of the instrument. Further on the composition of hydrothermal minerals and volatile content of igneous rocks were analysed, and the results helped us to make clear the origin of some parts of the Tokaj Mountains.

(1) Paulik J.: Proc. IV. Int. Conf. Therm. Anal., Budapest, 3, 789, (1976)
(2) Bohátka S.: Proc. 8th Int. Vac. Congress, Cannes, Vol. II. 243 (1980)

INVESTIGATIONS WITH A QUADRUPOLE MASS SPECTROMETER - -DERIVATOGRAPH COMBINED SYSTEM

G. Szöőr*, S. Bohátka

*L. Kossuth University Institute of Mineralogy and Geology, H-4010 Debrecen, Hungary

Hungarian Geological Society, Local Organisation - Lecture Session, Debrecen, 27-29 October 1982 (In Hungarian)

MEASUREMENTS WITH A QUADRUPOLE MASS SPECTROMETER -D RIVATOGRAPH COMBINATION

S. Bohátka, G. Szöőr*, G. Langer and I. Berecz

***L. Kossuth University Institute of Mineralogy and Geology, H-4010 Debrecen, Hungary**

Hungarian Annual Conference on Spectral Analysis and 7th Conference on Analitical Atomic Spectroscopy Sopron, Hungary 14-18, Jun, 1982.

A combination of a thermoanalytical device (Q-Derivatograph (1)) and a quadrupole mass spectrometer (2) is presented. The samples are placed in the furnace of the derivatograph and are heated according to a preselected program. The mass and temperature variations of the samples are measured very precisely in the derivatograph and the gaseous products are analysed by the quadrupole after a two-step pressure reduction. The response time of coupling system is 50 ms.
First we tested the instrument with measurements on carbonats, sulphates, simple salts (compounds and minerals alike) and organic compounds. The quadrupole enhances the sensitivity of the derivatograph and explains many details of the samples behaviour not revealed by a simple derivatograph. Some examples of the combined analysis are shown.

(1) J. Paulik and F. Paulik: Proc. IV. Int.Conf. Therm.Anal., Budapest 3, 789 (1976)
(2) I. Berecz, S. Bohátka et al: ATOMKI Közlemények 19 (1977), 123

MASS SPECTROMETRIC "IN VIVO" MEASUREMENTS OF GASES IN PLANTS

G. Langer, S. Bohátka, B. Schlenk, P. Bornemisza-Pauspertl

I. Buzás*, G. Pártay*, F. Sági, L. Mózsik****

***Research Institute Soil Science and Agricultural Chemistry of the Hung. Acad. of Sci. H-1525, Budapest, Pf. 35. Hungary**
****Cereal Research Institute H-6701 Szeged, Pf. 391, Hungary**

Hungarian Annual Conference on Spectral Analysis and 7th Conference on Analitical Atomic Spectroscopy Sopron, Hungary 14-18 June, 1982.

In the research of plant physiology measurements of gas-metabolism play an important role. Most methods require that plants should be examined isolated from their natural environment. This paper presents a method using a quadrupole mass spectrometer to directly measure gases in plants in gas--phase or dissolved in the liquids and tissues - without disturbing the metabolism and the environment of the plants. The applicability of this method is shown through a few examples. Finally, some possible further uses are referred to.

MASS SPECTROMETRIC MEASUREMENTS IN FERMENTATION TEHCNOLOGY

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Hungarian Annual Conference on Spectral Analysis and 7th Conference on Analitical Atomic Spectroscopy Sopron, Hungary 14-18, Jun, 1982.

Fermentation technology is essential in the production of antibiotics. The yield is strongly dependent on the bioligical, chemical and physical conditions of the metabolism, and in this respect the concentration values of exit gases and gases dissolved in the fermentation both are very important. A quadrupole mass spectrometer (1) with a special sampling system proved to be the best choice for this particular gas analysis problem. Sampling probes are perforated stainless steel capillaries covered with thin silicon rubber foil. The probes and the measuring method were tested on a small laboratory fermentes. O_2 and CO_2 concentrations bear close relation to the air supply and temperature of the fermentation broth and the stirring velocity. O_2 and CO_2 were monitored also during nebramycin and oxyteracylin manufactured in erythromycin production. The system and the method are good for continouous, simultaneous fast measurement of different gases of the industrial fermentation prcess, and a control system of fermenters is under construction.

(1) I.Berecz et al. ATOMKI Közlemények 19 (1977), 123

RESIDUAL GAS ANALYSIS

I. Berecz

Finommechanika-Mikrotehcnika 21 (1982) 371-376, No. 12.

Determination of the residual gas composition in vacuum systems is one of the most important problems. Investigations connected with the subject have essentially contributed to reach the up-to-date level of development in vacuum technology. It has been established by residual gas decomposition analysis what kind of gas components curtail the attainable final vacuum in materials applied to differents pumps or pump systems. In the course of investigations the method of residual gas analysis itself has improved essentially and provides an opportunity for application in certain production technologies. A known fact that the gas "atmosphere", in wich the thin film is produced, plays a great role in thin film production. Potentiality of observing and controling- and intervening in the right time - the gas composition of the operation sphere sorrounding the production processes offers a significant aid to produce thin film in the required quality. The residual gas analysis actually is a special mass-spectroscopic method. This paper discusses this method, its best known instrument the quadrupol mass-spectrometer and its applicability in thin film technology.

GAS CONCENTRATION DETERMINATION IN FERMENTERS WITH QUADRUPOLE MASS SPECTROMETER

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*Biogal Pharmaceutical Works H-4042 Debrecen, Pallagi ut 13.

9th Int. Mass Spect. Conf. Vienna Austria 30 Aug. - 3 Sept, 1982.

PLANT TESTS WITH QUADRUPOLE MASS SPECTROMETER

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**Cereal Research Institute H-6701 Szeged qf. 391, Hungary

9th Int. Mass. Spect. Conf. Vienna, Austria 30 Aug. - 3 Sept, 1982.

MASS SPECTROMETRIC INVESTIGATION OF GASES IN THE HOLLOW STEM OF WHEAT

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*Cereal Research Institute H 6701 Szeged, Pf. 391

Hungarian Conference on Plant Biology Szeged, 7-9 July, 1982
(In Hungarian)

MASS SPECTROMETRIC INVESTIGATION OF GASES IN CORN TISSUES

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*Res. Inst. Soil Science and Agricultural Chem. of the Hung. Acad. of Sci. H-1525 Budapest Pf. 35.

Hungarian Conference on Plant Biology Szeged 7-9 July, 1982.
(In Hungarian)

STATUS OF DEVELOPMENT IN THE FIELD OF CR-39 TRACK DETECTORS

G. Somogyi

Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference Bristol, 7-12 September 1981. Ed. Fowler, P.H.-Clapham, V. M. Nuclear Track: Methods, Instruments and Appliations Supplement No. 3. Oxford, New York, Toronto etc. 1982. Pergamon Press pp. 101-113.

The present situation concerning the manufacture and etching characteristics of the CR-39 nuclear track detector is surveyed. Especial attention is paid to the trends in research and to the outstanding questions related to the subject. The requirements and procedures in connection with the manufacture of high-quality, thick and thin detector foils are discussed. The main bulk and track etching characteristics are presented, involving the effects of various environmental parameters as well. A statistical account of the typical directions in appliation is given.

STUDY OF THE ELECTRICAL TREEING PRODUCED AROUND NUCLEAR TRACKS BY SEQUENTIAL ELECTRICAL AND CHEMICAL TREATMENT (SECT)

G. Somogyi and G. Almási

Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference Bristol, 7-12 September 1981. Ed. Fowler, P.H.-Clapham, V.M. Nuclear Track: Methods, Instruments and Applications Supplement No. 3. Oxford, New York, Toronto etc. 1982. Pergamon Press: pp. 245-249.

Characteristics of a new version of the electrical tree generation around fission and/or alpha-tracks have studied in PET, LR-115 and CR-39 detectors. The trees are formed around chemically etched track-cones by a treatment under alternating high electric field, when using electrolytes of different relative permittivity and a subsequent chemical etching for making the trees (spots) visible. The influence of the variation of main experimental parameters in the separated stages (track-etching, electric treatment, tree-etching) of the SECT has been investigated. The dependence of the mean spot size on the duration of treatment in these stages and on the temperature and relative permittivity of non-etching electrolytes (salts) has been studied. The most remarkable conclusion of our studies is that: with electrolytes of high relative permittivity the rate of tree-growth can be considerably enhanced and in CR-39 foils large spots of completely circular shape can be produced around nuclear tracks by the SECT-technique.

CHARACTERISTICS OF NEUTRON-IRRADIATED CR-39 FOILS TREATED BY SEQUENTIAL CHEMICAL AND ELECTROCHEMICAL ETCHING

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*Institute of Radiation Dosimetry, 180 86 Prague, Checzoslovakia

Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference Bristol, 7-12 September 1981. Ed. Fowler, P.H. Slapham, V.M. Nuclear Track: Methods, Instruments and Applications Supplement No. 3. Oxford, New York, Toronto etc. 1982. Pergamon Press: pp. 445-449.

The density of background spots revealed by chemical (CE) and electrochemical (ECE) etching and by their sequential application (CE+ECE) has been measured in several sorts of CR-39 material. The trends in the variation of sensitivity to Am-Be neutrons have been determined in CR-39 sheets covered by thick proton-radiator, when changing the field strength ($\sim$35 kV/cm), frequency ($\sim$ 10 kHz), etchant concentration, pre-etch duration and the fluence of neutrons. The results are analyzed in order to find out an optimum set of experimental parameters which may be proposed to attain high registration sensitivity to neutrons.

DIFFUSION PROCESSES IN DYED DETECTORS

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G. Somogyi and M. Tóth-Szilágyi

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Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference Bristol, 7-12 September 1981. Ed. Fowler, P.H. Clapham, V. M. Nuclear Track: Methods, Instruments and Applications Supplement No. 3. Oxford, New York, Toronto etc. 1982. Pergamon Press: pp. 299-306.

In order to get a better understanding of the dyed and fluorescent track detectors, the diffusion speed of the swelling agent, the sensitization molecules and the dye have been measured under various conditions. It is shown that the sensitization affects the entire detector while dyeing is restricted to the upper and lower layers of the detector. By combining the optimal values of the reactions parameters a higher contrast and sensitivity may be achieved.

EDUCATIONAL EXPERIMENTS WITH SOLID STATE TRACK DETECTORS IN THE NUCLEAR PHYSICS

M. Nagy, and G. Somogyi

Nuclear Energy- Nuclear Power, Seminar on the Teaching of Physics in Schools at Balatonfüred, 6th to 12th September, 1981. Ed.: Marx, George, Budapest 1981/1982, Központi Fizikai Kutató Intézet pp. 575-576.

A NEW AUTOMATIC TRACK COUNTING AND ANALYSING SYSTEM THE DIGITRACK

J. Molnár, G. Somogyi, S. Szilágyi, K. Sepsy

XIII. Int. Symp. on Autoradiography Tábor (Chechoslovakia) 1983 May 2-5.

DEVELOPMENT OF HIGH-SENSITIVITY CR-39 TRACK DETECTORS FOR CHARGED-PARTICLE RADIOGRAPHY

G. Somogyi, S. Szilágyi, I. Hunyadi and A. F. Hafez*

*Alexandria University, Physics Department, Alexandria, Egypt

XIII. Int. Symp. on Autoradiography Tábor (Czechoslovakia), May 3-5, 1983

ION-BEAM IMAGES IN GELATINE

Zs. Varga, G. Somogyi, I. Hunyadi and R. Ilic*

*Josef Stefan Institute, University of Ljubljana, Ljubljana, Yugoslavia

XIII. Int. Symp. on Autoradiography Tábor (Czechoslovakia) May 3-5, 1983.

NEUTRON INDUCED AND ALPHA AUTORADIAGRAPHY OF ROCKS

L. Medveczky

XIII. Int. Symp. on Autoradiography Tábor (Chechoslovakia) May 2-5, 1983.

MINIORANGE ELECTRON SPECTROMETER FOR IN-BEAM MEASUREMENTS

J. Gulyás, A. Domonyi, T. Kibédi, A. Krasznahorkay,
T. Fényes, Zs. Schram

Submitted to Pribory I Tekhnika Eksperimenta
(In Russian)

An electron spectrometer of "miniorange" type is described. The main parts of the spectrometer are as follows: reaction chamber, lock system for quick change of tragets, RECOMA permanent magnets, Si(Li) detector, and adjoining electronic instruments. The maximum efficiency of electron registration in peak may reach 10 % (from 4π) and the resolution of the spectrometer is 2 keV at E_e=177 keV (FWHM under in-beam conditions). The energy interval of electron transmission may be changed with relative shifting of the magnet frame and detector without breaking vacuum. Study of the conversion electron spectra of nuclear reactions showed that an effective background redution may be achieved by the use of the spectrometer.

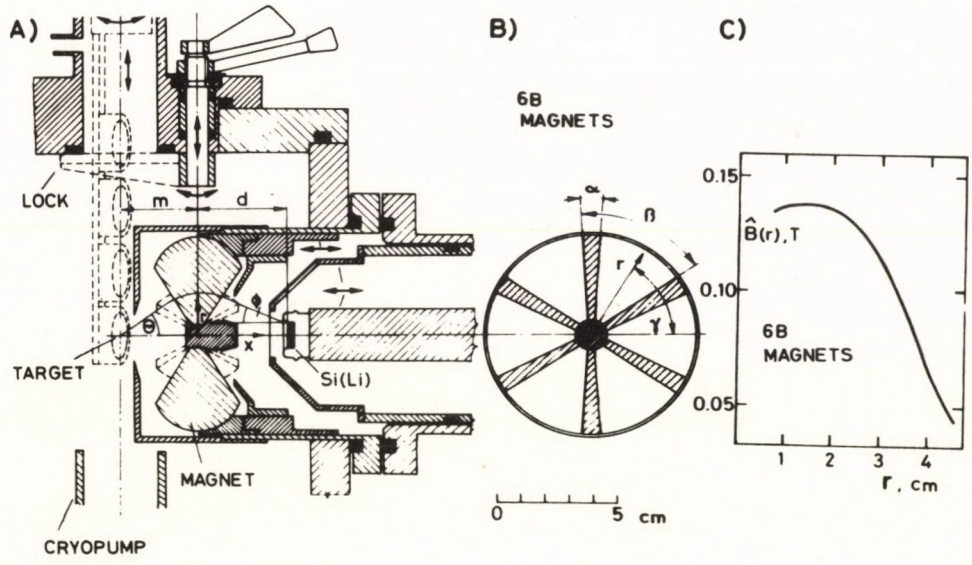

Fig. 1. A) and B) Simplified sectional drqwings of the spectrometer. C) Magnetic induction in the middle of the gap B(r) as a function of the radius (r). The indicated B(r) values are averages of magnetic inductions observed in six gaps.

ELECTROSTATIC SPECTROMETER FOR MEASUREMENT OF INTERNAL CONVERSION ELECTRONS IN THE 0.1-20 KEV REGION

D. Varga, I. Kádár, Á. Kövér, I. Cserny and G. Mórik

Nuclear Instruments and Methods 192 (1982) 277-286

A new second order focusing, n=1.5 cylindrical mirror electron spectrometer has been built. It enables us to measure the electrons emitted from the radioactive sources in the 0.1-20 keV region with an instrumental energy resolution of 0.1-1 %. The ringshaped input slit serving as a virtual electron optical object together with the large dimensions of the analyser (the total focal length equals 525 mm) allow us to utilize sources up to 1.5 cm^2 area. The spectrometer was adjusted using electron guns and tested also by ^{57}Co and ^{169}Yb radioactive sources prepared by vacuum evaporation and mass separation. The instrument operates automatically at oil-free vacuum of $4x10^{-6}$ Pa and the electron spectra are scanned in cycles. The background of the channeltron is about 1.5 counts/min.

A NEW ELECTROSATICAL SPECTROMETER FOR MEASUREMENT OF ANGULAR AND ENERGY DISTRIBUTION OF ELECTRONS

I. Kádár, D. Varga, S. Ricz, J. Végh, B. Sulik, D. Berényi

VIIIth International Conference on Atomic Physics, Göteborg, August 2-6, 1982

A NEW ELECTRON SPECTROMETER FOR SIMULTANEOUS ENERGY AND ANGULAR DISTRIBUTION MEASUREMENTS

D. Varga, I. Kádár, D. Berényi, Á. Kövér, S. Ricz
Gy. Szabó, J. Végh, I. Cserny, B. Sulik and G. Hock

7th Conference on the Application of Accelerators in Research and Industry
Denton, Texas, USA November 8-10, 1982.

INSTRUMENTAL RESEARCHES AND DEVELOPMENTS FOR STUDIES IN NUCLEAR AND ELECTRON SPECTROSCOPY

D. Varga

Dissertation for CPC, 1982, Debrecen
(In Hungarian)

SOLUTION OF AN OPTIMIZATION PROBLEM IN ION OPTICS

Z. Kormány

ATOMKI Közlemények 24 (1982) 237
(In Hungarian)

In a nuclear instrument of small acceptance it is very important to utilize its acceptance completely, especially, if the beam emittance is considerable. This requirement restricts the practicable placing of the instrument. In the paper a method is given to calculate these restrictions and the positioning of ESA 21 spectrometer [1] to a beam line of U-300 cyclotron of Joint Institute for Nuclear Researches (Dubna) is shown as a practical application.
The emittanes of the cyclotron beam are 40 π mm mrad an 16 π mm mrad in the horizontal and vertical planes, respectively, and the acceptance of the spectrometer is 7,6 mm mrad in those planes. Supposing constant density of particles in the phase space 0.92 % of the cyclotron beam enters to the target chamber. In the table below the results of some experiment are shown to demonstrate the correct positioning of the ESA-21 spectrometer.

Extracted beam (μA)	1.6	8.0	10.2	8.0
Target current (nA)	12	65	90	90
Transmission (%)	0.75	0.81	0.88	1.12

Reference

[1] D. Varga et. al., ATOMKI Közlemények 23 (1981) 40

NEW TRIPLE-FILAMENT ION SOURCE FOR THE MI-1309 MASS SPECTROMETER

É. Svingor

ATOMKI Közlemények 24 (1982) 157-162. No. 2.
(In Hungarian)

A reconstruction of the Soviet mass spectrometer MI-1309, which has been working in ATOMKI for ten years, was started in 1981. As a first step, its triple filament ion source was rebuilt. This resulted in an increase of the intensity and decrease of the fluctuation of the ion current.

APPARATUS ELGA FOR THE INVESTIGATION OF SHORT-LIVED ISOTOPES

Z. Árvay, V. V. Kuznetsov*, V. A. Utkin*, V. I. Fominych*,
J. Gulyás, T. Fényes, T. Kibédi, Zs. Schram, and A. Domonyi

*Joint Institute for Nuclear Research Dubna, USSR

Report at the Symposium on YASNAPP Program, Dubna, October 19-21, 1982.
(In Russian)

A HELIUM LEVEL INDICATOR WITH LED OR SCHOTTKY DIODE SENSING ELEMENT

K. Vad, D. Novák, S. Mészáros

ATOMKI Közlemények, 24 (1982) 251-252 No. 4.

APPARATUS "TOR" FOR THE INVESTIGATION OF THE DECAY SCHEMES OF SHORT-LIVED NUCLEI

Z. Árvay, V. V. Kuznetsov*, V. I. Fominyh*,
V. M. Tsupko-Sitnikov*, H. Lizurei*, M. Budzynski*

*Joint Institute of Nuclear Research, Dubna, USSR

Report at the Symposium on YASNAPP Program, Dubna, October 19-21, 1982.

PREPARATION OF COUNTING GAS OF PROPORTIONAL COUNTERS FOR RADIOCARBON DATING

E. Csongor, I. Szabó, E. Hertelendi

Radiochemical and Radioanalytical Letters

ACTIVITY DETERMINATION IN SAMPLES OF ISOTOPES MIXTURES BY USING SUM PEAKS IN GE(LI) SPECTRA

I. Uray, I. Török, E. Gyarmati

Submitted to Acta Phys. Hung.

LECTURES AND SEMINARS*

January 21.
Project for the measuring centre of the cyclotron
Gy. Bibok, A. Paál and K. Sepsy
(in Hungarian)

January 28.
The nonlocal and the equivalent local optical potential
G. Pálla
Central Research Institute of the Hungarian Academy of Sciences, Budapes, Hungary
(in Hungarian)

February 4.
Project for the agricultural and industrial application of the cyclotron
D. Berényi, I. Mahunka, and P. Bornemisza-Pauspertl
(in Hungarian)

February 11.
Differential L-shell ionisation cross-sections at ion impact
L. Sarkadi
(in Hungarian)

February 18.
About the dosimetry with thermoluminescent dosimeters
J. Félszerfalvi
Institute for Applied Physics, Kossuth University, Debrecen
(in Hungarian)

February 27.
The safety and checking system of the radiation protection at the Cyclotron Laobratory
I. Uray, A. Valek and G. Bibok
(in Hungarian)

March 4.
Light emission from thin layer metal-oxid-metal tunnel diodes
Zs. Szentirmai
Central Research Intitute of the Hungarian Academy of Sciences, Budapest, Hungary
(in Hungarian)

March 11.
Developments, results and future plans at the Technical Department of the Institute
I. Dombi, G. Mórik
(in Hungarian)

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*Held weekly on Thursdays at 2 o'clock pm.

March 18.
The fine structure of the nuclear radius.
The high spin slates of the ^{204}Bi nucleus
L. Végh
The nuclear spectroscopic investigations of the short-lived neutron deficient rear-earth isotopes
F. Tárkányi
(in Hungarian)

March 24.
The determination of the level-parameters of the ^{28}Si with (α,γ) and (α,α) reactions
E. Somorjai
(in Hungarian)

April 1.
The possibilities of application of mass-spectrometry in chemical, medical and environmental protection research
Z. Dinya
Department of Organic Chemistry, Kossuth University, Debrecen
(in Hungarian)

April 8.
Portable, high sensitivity X-ray fluorescence analyser
E. Vatai, and L. Andó
(in Hungarian)

April 15.
The possitilities of applications of the mass-spectrometric noble-gas analysis
K. Balogh
(in Hungarian)

April 22.
Designing the walls and doors of the Cyclotron Laboratory of the ATOMKI for the attenuation of the radiation
E. Szondi, S. Fehér, and É. Zsolnay
Reactor Laboratory, Technical University of Budapest, Hungary
(in Hungarian)

April 29.
Amplifier and signal processor system with time variant parameters for semiconductor radiation detectors
T. Lakatos
(in Hungarian)

May 6.
Nuclear Structure and Chemical Effects in Internal Conversion of the 35 keV M1+E2 transition in ^{125}Te
V. Brabec
Nuclear Physics Institute, Rez, Csechoslovakia

May 13.
Production of instruments in the ATOMKI
S. Jeney
(in Hungarian)

May 20.
Recent research and application of the Abo Akademi cyclotron
M. Brenner
Abo Akademi Turku, Finland

May 27.
The status of the preferred research projects and the ordered works
D. Berényi, and B. Schlenk
(in Hungarian)

June 3.
The development of gas-analitical instruments
I. Berecz, and S. Bohátka
(in Hungarian)

June 10.
Investigations of the electron spectra from H_1^+, H_2^+, He^+ →Ar collisions
Á. Kövér, D. Varga, G. Szabó, D. Berényi, I. Kádár, S. Ricz, and J. Végh
(in Hungarian)

July 15.
Rotating quasiparticles
S. Frauendorf
Zentralinstitut für Kernforschung, Rossendorf, German Democratic Republic

September 2.
The quasimolecular states of the nucleus and the interactiv boron model
J. Cseh
(in Hungarian)

September 9.
Nuclear methods in material science
K. Bethge
Institut für Kernphysik der Johan Wolfgand Goethe Universitat Frankfurt am Main, FRG

September 16.
Nuclear Tracks and their application (to nuclear physics, radiation protection, archeology, geology, space physics).
S. A. Durrani
Department of Physics, University of Birmingham, Birmingham, UK

September 30.
The evaluation of spectra in mass-spectrometric measurements
J. Antal
Physical Institute, Technical University, of Budapest, Hungary
(in Hungarian)

October 7.
Development of instruments and computer programs for electron-spectroscopic research
I. Cserny
(in Hungarian)

October 21.
Problems in the quantitative gas-analysis by mass spectrometry
R. Dobrozemsky
Österreichisches Forschungszentrum Seibersdorf Ges. MbH.
Institut für Physik, Wien

October 28.
New principles and methods for improving the parameters of nuclear measuring instruments
J. Gál
(in Hungarian)

November 18.
Direct test of the constancy of fundamental nuclear constants using the Oklo natural reactor
A. Shlyakhter
Leningrad Nuclear Physics Institute, Leningrad, USSR

November 25.
The nuclear spectroscopic investigations of the ^{96}Nb nucleus by conversion electron measurements
S. László
(in Hungarian)

December 2.
About the economic basis of the Institute
D. Berényi, and G. Kovács
(in Hungarian)

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Technical and physical research at the Technical University of Miskolc
T. Czibere
Technical University, of Miskolc, Hungary
(in Hungarian)

December 16.
The description of the relative motion of the α particle and the nuclear core in α-transfer reactions
K. Pál
(in Hungarian)

AUTHOR INDEX

Kiadja a
Magyar Tudományos Akadémia
Atommagkutató Intézete

A kiadásért és szerkesztésért felelős
Dr. Berényi Dénes az Intézet igazgatója

Készült az ATOMKI nyomdájában
Törzsszám: 22
Debrecen, 1983/junius